S. Sutton Rawlinson

THE LONDON JOURNAL OF Arts and Sciences; AND REPERTORY OF PATENT INVENTIONS.

CONDUCTED BY

Mr. W. NEWTON,

OF THE OFFICE FOR PATENTS, CHANCERY LANE.

(Assisted by several Scientific Gentlemen.)

VOL. XVIII.

(CONJOINED SERIES.)

LONDON:

PUBLISHED BY W. NEWTON, AT THE OFFICE FOR PATENTS, 66, CHANCERY LANE, AND TOWN HALL BUILDINGS, MANCHESTER; SHERWOOD, GILBERT, AND PIPER, PATERNOSTER ROW; SIMPKIN AND MARSHALL, STATIONERS' COURT; AND GALIGNANI'S LIBRARY, RUE VIVIENNE, PARIS.

1841.

R. FOLKARD, PRINTER, DEVONSHIRE STREET,
QUEEN SQUARE.

LIST OF PLATES IN VOL. XVIII.

[CONJOINED SERIES.]

THE

London

JOURNAL AND REPERTORY

OF

Arts, Sciences, and Manufactures.

CONJOINED SERIES.

No. CX.

Recent Patents.

To James William Thompson, *of Turnstile-alley, Long Acre, in the city of Westminster, upholsterer, for his invention of improvements in the construction of bedsteads; which improvements are particularly applicable to the use of invalids.*—[Sealed 16th December, 1839.]

These improvements, in the construction of bedsteads, particularly applicable for invalids, consist in certain arrangements of jointed rods, which may be separately or collectively raised or depressed, by means of toothed racks and pinions, or other suitable mechanism, whereby the body of the patient may be placed or brought into any position that may be required, in an easy and convenient manner, and without any exertion or perceptible motion to the patient himself.

But, in order that my invention may be more perfectly understood, I have represented, in Plate I., several views of my improved bedstead, and the positions the patient would assume, upon certain movements of the apparatus, such as when one part only of the apparatus is put in motion, by the mechanism; and, by means of which, certain parts of the jointed framing are raised, the other part being out of gear, and consequently remaining motionless. I have also shewn the position the patient would assume, upon actuating the mechanism, when all the parts are in gear.

Fig. 1, is a plan view of the bedstead complete,—all the parts of the apparatus being in their ordinary positions and situations; fig. 2, is a sectional plan view of the bedstead, with the upper jointed framing, with sacking and palliasse removed, in order to shew the working parts, and mechanical contrivances for raising parts or the whole of the jointed framing, as will be hereafter described; fig. 3, is a longitudinal section; fig. 4, a transverse section, taken through the middle of the bedstead; fig. 5, is a side elevation, shewing the manner of raising the upper part of the body of the patient; fig. 6, shews the two top and bottom joints, bent up so as to form the bed into the shape of a hammock, to prevent the person from falling out; and fig. 7, represents the jointed rods and framing, raised by means of the racks and pinions, some distance above the level of the palliasse, as would be the case when the bed is required to be made.

In all these figures, the same letters of reference, hereinafter mentioned, refer to corresponding parts. The framework is shewn at *a, a, a, a,* and the jointed rods at *b, b, b, b.*—These rods are held or retained in their straight form, and prevented from bending, (when not intended to do so,) by sliding tubes *c, c, c, c, c, c.* Other jointed rods

d, d, d, d, having joints corresponding to the rods *b, b, b, b,* are attached to the latter, and move or bend with them when required. To these rods *d, d,* the sacking, thin mattrass, or supporting sheet *e, e,* is attached by ropes or cords, in the ordinary manner. The rods *d, d,* are connected to the jointed rods *b, b,* by the metal blocks, or connecting pieces *f, f.* The jointed rods are attached to four upright racks *g, g, g, g,* by revolving or universal joints *h, h, h, h,* shewn detached, in figs. 8 and 9.—These racks are situated at the four corners of the bedstead, and are enclosed by tubes *i, i,*—see figs. 3, 4, 5, and 6.

The racks are moved up and down, by means of pinions *j, j, j, j,* mounted on the shafts *k, k.* On the centre of the shafts *k, k,* are fixed worm-wheels or pinions *l, l*; and these wheels are actuated, or caused to revolve, by the right and left-handed screws *m, m,* mounted on the shaft *n.* This shaft, which extends from the head to the foot of the bed, is caused to rotate, by turning the winch-handle. The pinions *j, j, j, j,* are mounted loosely on the shafts *k, k,* so that they may be slidden along the said shafts, for purposes hereafter mentioned.

A feather or raised part *o,* (see figs. 10 and 11,) is formed on the end of the shaft, and takes into a corresponding groove, formed in the pinion; therefore, as the shaft revolves, this feather or raised part, upon which the pinion is mounted, causes the said pinion to revolve with the shaft, as will be well understood. The pinions are moved in or out of gear, by pulling out or pushing in the handles *p, p, p, p,* which are connected to the pinions by short arms.

When it is desired to raise any particular part of the jointed framing, it is necessary to pull out the handle, attached to the pinion, which actuates that particular part, in order to bring the pinion into gear with the upright

rack. If, on the contrary, any part is required to remain stationary, the handle is pushed in, and the pinion will thereby be thrown out of gear; and when the shaft *n*, is turned, the said pinion will revolve with its shaft, without having any effect upon the upright rack.—This part of the invention will be better understood by referring to figs. 10 and 11, which represent detached views of the rack and pinion motion;—fig. 10, representing a front view, with the pinion out of gear, and consequently the rack stationary;—fig. 11, being a plan view of the same.

In the sectional plan view, fig. 2, the pinion is represented as being in gear, and ready to raise the rack, whenever the shaft *n*, is put in motion;—the situation of the pinion, when out of gear, is indicated by the dotted lines.

From the foregoing description, it will be evident, that any one part of the jointed framing may be raised, while the other parts remain stationary, by putting in or out of gear, as may be required, the pinions which correspond to such parts. For instance,—in order to raise the upper part of the body of the patient, it will be necessary to observe the following directions, which will be better understood by referring to fig. 5, in the drawing.

The sliding tubes *c*, on the longitudinal or side jointed rods, are to be removed from the joints, as seen in the figure; but the sliding tubes, belonging to the top and bottom rods, are to be slidden over the joints of these rods, as seen in fig. 1; the handles, at the lower end of the bedstead, and marked *, in fig. 5, are to be pushed in, in the manner shewn in figs. 10 and 11, and in dotted lines in fig. 2, so as to throw the pinions, belonging to the racks, out of gear; but the handles, at the upper end or head of the bedstead, are to be pulled out, in order to put the pinions in gear with the racks. The hooks or catches *q*, *q*, (see

figs. 2 and 5,) are for the purpose of preventing the pinions from being thrown out of gear, by the handles being accidently pushed in.

Upon motion being communicated to the shaft *n*, by the winch handle, the right and left-handed screws, on the said shaft, will cause the large pinions or worm-wheels *l*, *l*, and the shafts *k*, *k*, with the four small pinions *j*, *j*, *j*, *j*, to revolve; and, as only two out of the four of these pinions are in gear with the racks, it follows, that those two racks only will be raised, the other two remaining stationary; and, as the jointed rods are left free to bend, they will assume the position shewn in the figure.

Again, if it be required to raise the patient entirely off from the palliasse, for the purpose of making the bed, all the joints of the rods must be covered with the sliding tubes *c*, *c*, as seen in fig. 1; and all the pinions must be thrown into gear, by pulling out the handles, as in fig. 2. Then, upon causing the under shaft *n*, to revolve, the pinions will gradually raise all the racks, until the jointed framing assumes the position shewn in fig. 7.

In the drawings I have shewn only four different positions, in which the patient may be placed; but there are many others which may be obtained, by raising one or two racks, and allowing the others to remain stationary; and also by removing the sliding tubes from certain joints, and covering other joints with the tubes, so as to make them rigid, and prevent them from bending.

As any person, from the foregoing description, will be able to arrange the apparatus in such a manner as to cause the body to assume any posture that may be required,—I do not consider it necessary to give any further description of the method of carrying the invention into effect.

In fig. 1, I have represented the supporting sheet, which is in fact a very thin mattrass, as attached to the rods *d*, *d*,

by means of ropes or cords, in the same manner as sacking is attached to an ordinary bedstead; but sometimes I fasten the supporting sheet or thin mattrass to the rods *d, d,* by means of straps, attached to the under part of the said mattrass. Fig. 12, is a section of the framing, shewing the thin mattrass attached, in the manner just described. A feather bed may or may not be used in conjunction with the thin mattrass, as may be required.

The patient may be raised to any altitude, from the bed and mattrass, that the toothed racks will admit of; and, if it should be considered necessary, the racks may have an extra length affixed to their ends, by joints, in the manner shewn in fig. 13.

In order to avoid confusion in the drawing, I have shewn my improvements, as applied to a common iron bedstead; but, with very slight alterations, they may be adapted to any description of bedstead, and in such a manner, that no part of the mechanism is apparent,—the bedstead, in fact, having the appearance of one of the ordinary construction. The apparatus or mechanism may also, at any time, be adapted to, or detached from, a bedstead of the ordinary construction, without the necessity and inconvenience of pulling the said bedstead all to pieces.

In figs. 13 and 14, I have shewn the method I employ for adapting my improvements to a four-post bedstead. Fig. 13, is a side view or elevation, and fig. 14, a plan view. *a,* is the post of the ordinary bedstead, and *i,* is the hollow tube, containing the toothed rack before described. The hollow tube is fastened by screws, or otherwise, to the wooden post, by iron braces *r, r.* The horizontal shafts *k, k,* (see former figures,) are mounted in bearings, fixed to the wooden side rails of the bedstead; and the longitudinal or endless screw-shaft *n,* is mounted in similar bearings, formed on the under side of the head and foot rails.

In fig. 13, it will be seen, that I have made the upper

or revolving joint of the toothed racks considerably longer than in the other figures; and I have also added an extra length to the lower end, which length is attached to the rack, by a joint; a portion of the lower end of the tube being cut away, in order to allow the extra joint to come out into the position shewn in the figure. The effect of this would be, that when the apparatus is wound up, in the manner shewn in fig. 5, the patient would be brought much more into a sitting posture.

In conclusion, I wish it to be understood, that I do not intend to confine myself to the precise arrangement of mechanism herein shewn, nor to the number of joints to be made in the jointed rods, as the same may be varied without departing from the nature of my improvements; but what I claim, as my invention, is constructing bedsteads, particularly applicable to invalids, in which the patient may be brought into any position that may be required, by means of racks and pinions, in conjunction with jointed rods, which may, when necessary, be stiff and rigid, and prevented from bending;—any one, two, or more of such pinions, being thrown in or out of gear; and any one, two, or more of such jointed rods, being rendered stiff and rigid; or jointed, as may be required.—[*Inrolled in the Rolls Chapel Office, June,* 1840.]

We feel great pleasure in stating, that Mr. Thompson's Patent Invalid Bedstead, has met with the decided approval of some of our most eminent surgeons. The facility with which a patient, when reclining thereon, can be moved or brought in any position that may be required, is a desideratum of no inconsiderable moment to invalids.

We understand that a model of the bedstead has been submitted to Her Majesty, and approved of. We are also informed, that some of the London Hospitals have given

orders for one or two; and if they answer the expectations entertained by the medical gentlemen of these establishments, these bedsteads will, no doubt, come into extensive use; especially for accouchements, for which they are peculiarly applicable, as the bed can be made without at all disturbing the invalid. A complete bedstead may be seen at the Polytechnic Institution; and models and bedsteads, of various descriptions, are shewn and described by the Patentee, at his house, Maddox-street, Hanover-sq.—Ed.

To Henry Bernard Chaussenot, *of Leicester-square, in the county of Middlesex, civil engineer, for his invention of an improved construction of the lamps or apparatus used for burning gas, for producing a better combustion of the gas.*—[Sealed 28th July, 1835.]

The object of the patentee, is to heat the atmospheric air, which is to support the combustion of the gas, before, it comes in contact with the burner. For this purpose, instead of admitting the air, in its ordinary state, immediately from the open atmosphere, through the bottom of the gallery, as is the usual practice, the patentee encloses the ordinary glass chimney by an outer chimney or casing of glass. The air, for supplying the burner, is then admitted at the upper part of the outer tube, and passes down between the two glass tubes; which air, in its progress, becomes heated by the radiation of the flame, and enters the inner tube or glass chimney at bottom, in a heated state, near the burner. This mode of supplying the air, it is found, greatly assists combustion, and causes the gas to be more completely consumed, and to give out a more intense light than could be obtained if the combustion were supported by a current of cold air.

This object is proposed to be effected by several modifications of apparatus, all embodying the same elementary principles, shewn in the following figure :—

Plate III., fig. 1, represents a gas burner, with its glass chimney and outer tube. *a,* is the gas burner of the ordinary kind; *b,* the glass chimney, resting upon a gallery *c, c,* which is open at bottom, as usual; *d, d,* is a lower gallery, closed at bottom, which supports the outer glass tube *e, e.* On the top edge of the chimney *b,* a cap-piece *f,* is supported, which carries an upper glass tube *g,* forming a continuation of the chimney.

The outer glass tube *e, e,* closed at the bottom by its gallery *d,* does not reach quite up to the cap-piece *f,* but is embraced at top by the open fret-work, pendant from the cap-piece; consequently, the only air which can pass to the burner, must enter through the fret-work above the tube *e,* whence it proceeds downward between the two glasses, and, becoming heated in its passage, enters the interior of the tube *b,* through the open gallery *c, c,* at bottom, in a highly rarified state, and thereby supports the combustion of the gas, in a more perfect manner, and with a superior effect to that of a current of cold air.

The patentee says, that his object is to collect or retain the heat given out by the flame of a gas burner, for the purpose of heating the air which is to support combustion; and claims, as the particular feature of his invention, such an improved construction of lamp as compels the atmospheric air, for supplying combustion, to pass in contact with a heated outer chimney or case, so as to raise the temperature of the air before it is supplied to the burner. —[*Inrolled in the Inrolment Office, January,* 1836.]

To Ernst Wolff, *formerly of Stamford Hill, in the county of Middlesex, but now of Camberwell, in the county of Surrey, merchant, for a certain improvement or certain improvements in steam-engines,—being a communication from a foreigner, residing abroad.*— [Sealed 26th April, 1834.]

This invention consists in employing steam to work two or more engines successively, and thus compel it to expend all its elastic force before escaping into the atmosphere.

The first of the engines must be worked under high pressure; the second and following, are low pressure engines. Steam, passing from the boiler, in a state of high pressure, into the cylinder of the first engine, acts upon the piston, and then proceeds through an eduction pipe into the cylinder of the second engine; or else into an outer jacket of the same, and thence into the cylinder; and, after acting upon its piston, passes off into the condenser, or escapes into the atmosphere. If there be a third engine, the steam proceeds into the working cylinder,—acts upon its piston, and then passes to the condenser, or into the atmosphere.

In place of the steam passing from the cylinder of the first engine, into the outer jacket of the cylinder of the second engine direct, it may be better for it to pass through a separate steam-chamber, in which the pressure of the steam may be raised, by heating the said chamber by a separate fire; or fresh steam may be blown into it from the boiler; and an auxiliary quantity of steam may be passed into the cylinder of the second engine, direct from the boiler, in case the boiler generates more steam than is required to work the first engine at a high pressure.

The power of these engines may be applied to turn the same or different crank shafts, at one time.

The patentee claims the invention above described, by

which the same steam is made to act upon two or more engines in succession, so that a greater degree of power may be obtained from the same quantity of steam.—[*Inrolled in the Inrolment Office, October*, 1834.]

This plan of economising steam has been several times introduced to the public in previous patents.—See Uding's, for improvements in steam-engines, Vol. IV., page 191, of our Second Series.—Ed.

To James Harvey, *of Basing-place, Waterloo-road, in the county of Surrey, timber merchant, for certain improvements in paving streets, roads, and ways, with blocks of wood; and in the machinery or apparatus for cutting or forming such blocks.*—[Sealed 2nd June, 1840.]

My invention of improvements in paving streets, roads, and ways, with blocks of wood, consists, in the first place, in the adaptation of certain novel shapes or configurations, forming blocks of wood, to be applied to paving; and secondly, in an improved machine, whereby I am enabled to cut and form blocks, to the required shape, in a quicker and more economical manner than has heretofore been done.

In order that my invention may be fully understood, I have annexed to these presents, drawings explanatory of the different shapes of blocks I intend to use, in paving streets, roads, and ways; and also several views of the machinery I employ for forming certain of the blocks therein shewn.

The figures in Plate II., represent the forms of various shaped blocks, which I employ for the purpose of paving. Figs. 1, 2, 3, and 7, are different views of one block; figs. 4, 5, 6, and 8, are similar views of another or companion block, which, when put together, support each other.

Fig. 1, represents one of the blocks, as it would appear if seen cornerwise; fig. 2, shews the flat side of the same; and fig, 3, is the reverse side, exhibiting that surface of the block which is indented or formed into two equal pyramids.

Fig. 4, is the fellow or companion block to the one just described, and represents its angular side, formed by two pyramids, in a similar view to that shewn at fig. 1; fig. 5, is a view of the flat side of the block, corresponding with the position shewn at fig. 2; fig. 6, is the reverse side of the same, corresponding to the view shewn at fig. 3; and figs. 7 and 8, are end views of the two blocks, seen in perspective.

Figs. 9 and 10, represent an elevation and horizontal view of four blocks combined; that is,—two pairs placed together, and fitting into each other.—These blocks, when combined to form a pavement, are so arranged that they support each other, as, from their double-wedged shape, no one block can rise without disturbing those that are contiguous. Figs. 11, 12, 13, and 14, are views of another block, which is produced from a cylinder, cut into six sections through its axis, so as to form wedges, the sides of which subtend angles of 60°.

Fig. 11, is an elevation of a single block of the above form, presenting its curved face; and fig. 12, is a plan view of the same.

Fig. 13, is an elevation of several of these blocks, in connection; and fig. 14, is a plan view of the same.

Figs. 15 and 16, represent the plan and elevation of a continuation of several blocks of another shape, which may be described as consisting of segments of a cylinder, cut parallel to the axis, in a meniscus form; fig. 15, shews an elevation of two of these blocks; and fig. 16, is a plan or horizontal view of four of these blocks, arranged as they would be when laid down for the pavement of a road. It

will be seen, that these segments are set upright, in alternate rows; the one row presenting the concave surface, and the other row the convex surface, so as to afford a convenient holding for the feet of horses.

Fig. 17, represents an elevation of two blocks of another form, and fig. 18, is a plan view of the same. This block may be described as an oblong four-sided prism, having each of its extremities bevelled off in parallel planes, at oblique angles to the sides. These blocks, when laid down, are arranged in the manner represented at fig. 19, which is a horizontal view of a portion of each row of blocks, tending to support one of the contiguous rows, whilst it is itself supported by the other row, with which it is in contact.

Figs. 20 and 21, represent a side elevation and plan of another block, which is shaped as the last described, but has a rebate cut in each of its acute angles. Fig. 22, exhibits two of these blocks, placed in contact, as laid down for paving.

Figs. 23 and 24, are a top view or plan and elevation of another shaped block, formed as if two oblong four-sided prisms were each cut off at one of their angles, and conjoined to constitute one block.

Figs. 25 and 26, are similar views of another block, which may be described as a four-sided prism, having angular recesses cut in two of its corners, half way down, and similar recesses cut in the other two corners, half way up, so as to constitute rebated edges. When these blocks are employed for paving, by their peculiar shapes and ledges, they both support and are supported by the surrounding blocks, so that the pavement being completed, by the combination of several blocks, no one block can be withdrawn without disturbing the others. The plan, fig. 27, shews the manner of connecting them.

Fig. 28, represents, in elevation, a modification of the last-described block; but, in this instance, cut out of a cylinder instead of a cube; fig. 29, is the horizontal view of the same; and fig. 30, shews the manner in which several of these blocks are to be combined to constitute a pavement.

Figs. 31, 32, and 33, exhibit another peculiarly shaped block, which, from its wedge-form, may also be called self-supporting, as each block bears up the two contiguous blocks.—These may be geometrically described as parallel rectangular blocks, on their upper and lower surfaces, but wedge-shaped at the sides, having the grain or fibres of the wood placed obliquely. The upper surface of the conjoined beams may be ribbed with parallel grooves, about one-fourth the width of the smooth portions, for the horses' feet to hold by.

Fig. 31, is a side elevation of two blocks, placed together; fig. 32, is an end elevation of the same; and fig. 33, is a horizontal view of the two blocks, as laid down for paving.

It will be perceived, that the sides of the block *a*, gradually taper towards the base, but the ends gradually taper towards the summit. The reverse, however, is the case with the block *b*; for the *sides* of this block gradually taper towards the summit, while the *ends* thereof taper towards the base.

From this description it will be evident, that the block *a*, is supported by the block *b*, by resting on its inclined sides; and the block *b*, will be supported, at its ends, by two blocks, similar in shape to the block *a*; thus, each block supports and is supported by the adjoining blocks, with which it is in contact, as above described.

Figs. 34 and 35, represent a block in the form of a cross, all the sides being equal, and at right angles with each other. If considered necessary, the upper edges of the

block may be bevelled off, as shewn in the preceding figures, so as to give a good hold to the horses' feet; or grooves may be cut in the top face of the block, for the same purpose.

Figs. 36 and 37, are similar views of a modification of the cross-shaped block, in which two of its arms are made a little higher than the other two, in order that their upper surfaces, when several are combined, may not be in the same plane, but leave a hollow for the holding of the horses' feet.

Fig. 38, represents another shaped block, which may be considered as a modification of the block shewn at figs. 15 and 16, being a segment of a cylinder, cut in a meniscus form; fig. 39, exhibits, in elevation, three of these blocks connected; and fig. 40, is a plan or horizontal view of nine of these blocks combined, so as to constitute part of a pavement.

I will now proceed to describe the machine, by means of which I am enabled to cut or form certain of the blocks, above described, in a very speedy and economical manner:—

Plate II., fig. 41, represents a vertical section, taken longitudinally through the machine; fig. 42, is a horizontal view of the same; and fig. 43, a transverse section, taken vertically. The frame-work is shewn at *a, a, a, a*, and should be made of cast-iron, in order to obtain a sufficient degree of strength. A crank-shaft *b*, actuated by a steam-engine, or other convenient power, is mounted in the framing, at about the middle of the machine. Two connecting rods *c, c*, are attached to the crank; and to the reverse ends of each of these rods, a cross-head *d, d*, is connected. This cross-head slides in guides *e, e*, formed in slots in the frame-work. The rough block of wood, intended to be operated upon, is shewn at *f*, supported but not fixed upon the table *g*, in front of the stationary knife or cutter

h; the form of the cutter or knife-edge blades being of course variable, according to the shape of the block desired to be produced.

The operations of the machine will be as follow:—When the block of rough wood *f*, has been placed upon the table *g*, (but not fixed thereon,) the crank-shaft *b*, in its revolution, will cause the cross-head *d*, to force or thrust the block of wood *f*, a certain distance forward against the edges of the stationary knife *h*. The further rotation of the crank *b*, will then cause the cross-head *d*, to recede, when another rough block of wood must be placed upon the table, behind the former; and, on the next advance of the cross-head, its pressure against the second block, will force the first block through the cutter, that is, beyond the knife-edges, and deliver the block beyond the cutter, shaved or cut to the required form.

It will be seen, by reference to fig. 3, that the knife or cutter, shewn as fixed in the machine, is intended to produce octagonal blocks; such cutter may however be removed from the machine, by unscrewing the bolts *i*, *i*, *i*, *i*, when a cutter of any other shape or construction may be adapted in is place, to produce another shaped block.

I would here observe, that although I have shewn in the drawings, a cutter, formed apparently of one piece of steel, yet I sometimes make the cutter of two or more pieces; and I have further found it eligible, in the case of a cutter being constituted of two parts, to place the under cutter in advance of the upper cutter, in order that the advanced knife may first perform its operation upon the block, and allow the second cutter to finish the said block, whilst the first cutter is begining to operate upon the following block.

Although I have shewn the machine as acting horizontally, yet I sometimes place the cutter immediately below the crank-shaft, and cause the block to be formed by the

downward thrust of the cross-head. This last arrangement may be employed in situations where the horizontal space, occupied by a machine of the construction shewn in the drawing, is a consideration worth attending to, as a machine, with the downward thrust, would not occupy more than half the space of the horizontal one. I have not, however, thought it necessary minutely to describe a machine of this construction, as any good mechanic would, from the foregoing description, be enabled to construct a machine, possessing the same principles, to suit the circumstances and situation, as might be required.

In conclusion, I wish it to be understood, that I claim, as my invention, in the first place, the shapes and configurations of all the blocks above described; and secondly, the application of a stationary knife or cutter, of any shape, in connection with the machinery described, to cut or form blocks of wood for paving streets, roads, and ways, in whatever manner such cutter may be applied.—[*Inrolled in the Rolls Chapel Office, December*, 1840.]

Specification drawn by Messrs. Newton and Berry.

To WILLIAM SAUNDERS, *of China-terrace, in the borough of Lambeth, and county of Surrey, chemist, for certain improvements in paving streets, roads, and ways.*—[Sealed 3rd August, 1840.]

MY invention of certain improvements in paving streets, roads, and ways, consists, in the first place, of a new shape or configuration, in which a block of wood is to be formed; and secondly, in the method or methods of combining blocks of wood so formed, as to make a firm and solid pavement, to suit different circumstances; and which, when

properly laid, will constitute a compact and solid mass, each block being supported by, and also tending to support, the surrounding or contiguous ones.

The block I propose to use for paving, is shewn in Plate II. Fig. 1, is a front or back view of the block; fig. 2, is a plan or bird's-eye view of the same; and fig. 3, is a side view. By referring to these figures, it will be seen, that each block is in fact composed of three distinct blocks, which are fastened or attached together, by pins or tree-nails,—the centre block being twice the thickness of the side blocks, and carrying the pins, bolts, or tree-nails, the ends of which are inserted into holes made in the side blocks for that purpose.

Fig. 4, represents the centre and two side blocks, detached and ready to be pinned together, in the way above mentioned.

The proper angle for producing the blocks of the required form, is obtained in the following manner:—Draw a rectangular four-sided figure *a, b, c, d,* fig. 5, and divide the top and bottom sides into three equal portions, marked 1-2-3-4; then, in order to obtain the angle of the centre block, draw a line from the top left-hand corner *a,* of the square, (see fig. 6,) to the point 3, on the bottom side; and again, from the point 2, on the upper side, to the right-hand bottom corner *d.* And to produce the opposite angle for the side blocks, draw a line from the point 1, (see fig. 7,) to the left-hand bottom corner *c,* and also from the top right-hand corner *b,* of the square, to the point 4, on the under side.

The required angles of both blocks having been thus ascertained, a log of wood must be prepared to the proper thickness, and the blocks cut therefrom, in the manner shewn in fig. 8.

Sometimes, under certain circumstances, instead of con-

necting the blocks together by means of pins or tree-nails, I cut grooves in the sides of the blocks; and these grooves, when the blocks are brought into contact, form mortices, in which I insert dowells, as shewn in figs. 9 and 10.

Fig. 10, represents a side view of a number of the compound blocks, connected together in the manner above shewn.

Having now described the mode of forming the blocks, I will proceed to explain several methods of combining them together, in order to produce a firm and solid pavement. Fig. 11, represents a plan or bird's-eye view, of which fig. 10, is the elevation. This is the most simple mode of combining the blocks, and will be found very convenient under some circumstances, such as over gas and water pipes, where the pavement would be liable to occasional removal. The different rows of blocks may be connected together either by pins or tree-nails, as shewn in figs. 3 and 4, or by dowells, as shewn in figs. 9 and 10.

Another arrangement or combination of the compound blocks, is represented at fig. 12; and from the peculiar shape of the block, as well as the method herein shewn, of combining a number together, the pavement, when complete, cannot either rise or sink from unequal pressure; but yet it may be removed with facility when once an opening is made. Each compound block is supported by the four surrounding ones; and this also tends to support each of those four in the following manner:—

The compound block A, is composed of the three blocks *a*, *b*, and *c*, as before explained. The block *a*, slanting in one direction, and the blocks *b*, and *c*, in the opposite direction. Now the centre part *a*, of the block A, rests upon and is supported by the parts *d*, *e*, of the two blocks immediately above, while the central parts *f*, *g*, of the same blocks, rest upon the parts *b*, *c*, of the block A, in con-

junction with the corresponding parts of the contiguous compound blocks. And again,—the parts *b*, *c*, of the block A, are in their turn supported by the centre parts *h*, *i*, of the blocks immediately below, while the narrow parts *j*, *k*, of the same block, rest upon the part *a*, of the block A, as shewn by dots.

From the foregoing description, it will be evident that there is the same resistance to a pressure upwards as downwards; but at the same time, the block can be removed endways with the greatest facility.

Fig. 13, represents a number of compound blocks, combined together in a similar manner to that shewn at fig. 12, the only difference being, that the rows of blocks are placed angularly, or diagonally, across the road; and the triangular spaces left at the sides of the road, as shewn in the figure, are to be filled up with sections of the block. This arrangement will be found convenient, when a long and narrow strip of the pavement is required to be removed.

Sometimes the two methods of combining the blocks, herein shewn, are employed together;—that represented in fig. 11, in any situation where the pavement is likely to be disturbed; and the more extended surface of the road may be covered in the way shewn in fig. 12. If thought desirable, the surface of the block may be roughened to a greater degree than that shewn in figs. 11, 12. and 13, and may be cut or grooved into small squares, as shewn in fig. 14, in order to afford a better and firmer hold for the horses' feet.

Having now described my invention, and the manner of carrying the same into effect, I wish it to be understood, that I claim, as the invention secured to me by the hereinbefore in part recited letters patent, first,—the formation of a compound block for paving streets, roads, and ways, consisting of three distinct blocks, the centre one of which

is equal in solid contents to the two side ones,—the sides of which slope to the angle herein shewn; and secondly,—I claim the methods, hereinbefore described, of combining a number of these said compound blocks, to form a compact and solid pavement; such blocks, when so combined, supporting and being supported by each other.—[*Inrolled in the Rolls Chapel Office, February,* 1841.

Specification drawn by Messrs. Newton and Berry.

To SAMUEL WAGSTAFF SMITH, *of Leamington, iron-founder, for his invention of improvements in apparatus for supplying and consuming gas.*—[Sealed 9th June, 1840.]

THIS invention relates to the method of constructing gas burners, whereby the gas to be consumed, is, in its passage to the point of ignition, heated by the flame produced by the burner.

Fig. 1, Plate III., represents a front view of an argand burner, constructed with a view to effect the above object; and fig. 2, is a side view of the same. The burner is seen at *a*,—and *b*, is the supply pipe. The gas from the main passes up the pipe *b*, and into and through a circular pipe *c*, above; from whence it descends by the pipe *d*, to the burner *a*, as shewn by the arrows in fig. 1; and by the time it arrives at the burner, it will be considerably heated by the flame. The result will be, an advantageous and economical consumption of gas; as a less quantity of gas, when heated, will give an equal light to that which would be given by a greater quantity when not in a heated state.

Fig. 3, represents a front view of a bat-wing burner, constructed in the improved manner; and fig. 5, is a plan view of the same, Although the parts are somewhat dif-

ferently formed and arranged, yet the principle of the invention is adhered to; and this figure will be perfectly understood by referring to the description of figs. 1 and 2, as similar letters denote corresponding parts in both constructions.

The patentee says, the object of the invention being to heat the gas by the flame of the burner, previous to consuming it by the said burner, it must be obvious that the apparatus may be made in a variety of forms,—he does not therefore confine himself to the form herein shewn.

Fig. 4, represents a side view of a bat-wing burner, that presents a very different external appearance, but yet is constructed upon the same principle as that shewn at fig. 3. In fig. 3, the burner is placed between the two pipes *b*, and *d*; but in fig. 4, these pipes are placed close together, and one behind the other, the burner being in front of both.

The patentee says, in conclusion: "having thus described my invention, and the manner of performing the same, I would have it understood, that what I claim as my invention, is the mode of constructing and applying apparatus to burners, whereby gas, in a heated state, is supplied thereto, in order to be consumed; such heating of the gas being caused by the flame of the burner so supplied.—[*Inrolled in the Inrolment Office, December,* 1840.]

To George Beale Brown, *of New Broad-street, in the city of London, merchant, for certain improvements in machinery for making or manufacturing pins, of the kind which are commonly used for fastening wearing apparel.*—[Sealed 27th June, 1833.]

This invention is an improved arrangement of machinery for making pins, for dresses or wearing apparel. The heads

of the pins are to be formed of curls of fine wire, commonly called spun heads, which wire is applied around the stem or shaft of the pin. The heads being fashioned to a correct form and placed on the stem, are, by compression between dies, made fast to the stem, and at the same time are formed to a bowl shape.

All the moving parts are actuated by a continuous rotary motion, given to the main axis. The machine feeds itself by drawing in from hanks, placed at the side, the requisite supplies of wire, of two sizes, viz:—strong wire for making the shafts of the pins, and fine wire for forming the heads. A bevel-edged file wheel produces the point of the pin, by rapidly revolving against the end of the shaft; and when the pin is completely made, its whitening operations may be performed, in the manner commonly practised upon pins made by hand.

There are three pins in the machine at the same time, in progress of formation, but at different stages of that progress, viz:—First, after bringing in the piece for the shaft or stem, the fine wire, to produce the head, is coiled around the end of the large wire or stem. Secondly, the proper form is given to the head, and it is fixed fast on the end of the stem by pressure, between suitable steel dies. And thirdly, the grinding and shaping of the sharp point of the pin.

The principle features of this invention are shewn in a detached view in the figure, Plate III. *a*, is the large wire of which the stem is to be formed, which is introduced through the hollow axis D, by the rollers *o*, *o*. These have an intermitting motion, advancing the wire the length of one pin at each stroke. *b*, is the fine wire for the heads, which is caused to cross the large wire by means of the feeders *c*; C, C, are sliding cutters, for cutting and holding the wire; E, E, are two steel dies, which have a recess in the top corresponding to the shape intended for the bottom of the

pin's head; A, is a cog wheel fixed on the axis D, to which an alternating revolving motion is communicated;—by that means the beak *f*, of the axis D, as it revolves, catches hold of the end of the fine wire *b*, and winds it round the large wire or shaft, to form the head of the pin; F, is a punch which gives the head of the pin its proper shape at the end, having a sliding cap *d*, which holds the dies E, E, together, while the punch, within *d*, is striking the head; G, is a pair of revolving pincers, having a handle *e*, and a spring *g*, acting upon the handle, which gives the pincers a tendency to remain closed, but they are opened occasionally by a stud pressing on the handle. The pincers are turned by an endless band, embracing the roller H. The punch and pincers are attached to one and the same carriage, which is fastened to a horizontal axis at the bottom of the machine, the carriage moving to and fro with an intermitting motion.

The process of making pins, is as follows:—The large wire *a*, having been cut by the dies, and a head formed on it, is moved forward one length by the rollers *o*, *o*; the fine wire *b*, is then moved forward a length, sufficient for one head, by the advance of the feeder *c*; the cutters C, C, with the dies E, then approach and grip or hold the fine wire upon the stem *a*, and a rotary motion being communicated to the axis D, its beak *f*, catches the fine wire and twists it round the large wire, and thus produces the embryo of the head. Whilst this has been going on, the punch has advanced, and, by the assistance of the dies, formed the head of the pin to its proper shape; and the carriage, on which it is fastened, being now moved, causes the pincers G, to occupy its place. The length of wire on which the head has been made, is now cut off, by the cutters, and is then seized by the pincers G;—the carriage, being slidden back again, carries with it the pin, to the revolving grinding wheel K, where its point is produced.

The punch having returned to its first position, the cutters C, C, and the dies E, E, are now raised, and the wires *a*, and *b*, advance one length, as before;—the cutters and dies then approach, the punch advances, the head is formed, and the pin finished as above described.

A second machine is described, for delivering two pins at each revolution of the main axis, which differs from the first, only, in having two sets of the machinery.

The patentee claims the combination of various parts or pieces of mechanism, constituting the two self-acting machines, for making or manufacturing pins, with heads formed of curls of fine wire, applied round the strong wire, whereof the stems are formed.—

The minor or subordinate combination of parts, for curling the end of the fine wire around the end of the strong wire, before either of those wires are cut into the portions requisite for forming distinct pins.—

The minor or subordinate combination of parts, for disposing and holding fast the ends of the wires, so that they cross each other, between the edges of the cutting blades, in proper relative positions for undergoing the curling, which is to be performed by the aforesaid second minor combination. And after the curling has been performed, the said parts, for so holding the wires then cut off from the end of the fine wire, so much thereof as has been curled, and likewise by the same cutting action, cut off so much from the end of the strong wire, as is sufficient to form the stem of one pin, leaving the said curls of small wire on that extremity of the strong wire, from which the aforesaid portion thereof has just been detached; the said curls being ready to be pushed forwards, with the strong wire, when the same is again advanced.

Lastly, the particular kind of revolving grinder, for forming the points of the pins, which has two grinding surfaces,

forming an angular groove around the circular grinder, both of which grinding surfaces cut the end of the stem at the same time, but with different degrees of tapering; one of the said grinding surfaces forming a tapering end to the stem, and the other grinding a pricking point thereto.—[*Inrolled in the Rolls Chapel Office, December*, 1833.]

The Specification of this invention, does not very clearly set out the details of this machine, but it may be fully understood by reference to the Patent of L. W. Wright, for making pins, granted in 1824, (see Vol. IX. of our First Series,) the leading features of which are the same as those above described, excepting that in Wright's machine, solid heads are formed on the pins, by crushing the ends of shafts in the dies; whilst in the latter invention, the heads are produced by coiled wire, spun on (as it is commonly termed). We believe that the resemblance between the two is so evident, that it has not been thought advisable to carry the latter invention into operation.—Ed.

To Charles Chubb, *of St. Paul's Church-yard, in the city of London, patent detector lock manufacturer, and* Ebenezer Hunter, *of Wolverhampton, in the county of Stafford, locksmith, for their invention of certain improvements in locks, and for fastening and security.*—[Sealed 20th December, 1833.]

This invention consists of improvements on the detector lock, for which a previous patent had been granted,—the first to Jeremiah Chubb, dated 1818,—and secondly, to Charles Chubb, dated 1824.—See Vol IX. of our First Series, page 416.

Part of these improvements apply to the simplification of the internal parts of the detector lock, by the application of a simple kind of detector. This detector is a small bar, suspended by one end, the other end being formed into a hook, at the back of which is a small spur. The tumblers (which are either four or five) are circular plates, having a variety of different passages, through which a stud, attached to the bolt of the lock, passes. These passages are made to correspond with each other, by means of different projections on the bit of the key, which projections raise the tumblers to different heights. All these passages must correspond, and have a free entrance for the stud on the bolt, before the lower projection on the bit of the key can draw back the bolt.

In order to apply the detector, a small notch is cut in the edge of any one of the tumblers, so that on a pick-lock or false key being introduced, or any attempt made to open the lock, the tumblers are raised, and the hook of the detector catching into the notch in the edge of that one tumbler, detains it in its raised position.

When the lock is in this state, it cannot be unlocked even by the true key; an extra notch is therefore cut in the under part of the bolt, by turning the key into which, the bolt is overshot. During the over-shooting of the bolt, a nib or stud attached to it, comes in contact with the spur of the detector, and draws it back from the tumbler, which being now released, is brought to its proper position, by means of its spring. The tumblers being placed all in their proper positions, the lock can be unlocked.

The tumblers may likewise be caused so to act, that on a pick-lock or false key raising any of them, the tumbler so raised, will raise the one that is acted on by the detector. This is effected by attaching a small bar to the detecting tumbler, which bar is received in notches cut in

the other tumblers, so as not to offer any obstacle to the ordinary mode of working; but when any of the other tumblers are raised, they raise the detecting tumbler by means of the bar.

Another part of these improvements applies to double-locking this detector lock, by means of an additional key. The passages in the tumblers are made rather different to those above mentioned, and there is an additional notch cut in the under part of the bolt; but the remainder of the works are the same. The lock is first locked by the ordinary key, and then by the additional one, which turns into the other notch; the tumblers are thus raised to a different position by the second key, for the purpose of allowing the stud on the bolt to pass into the outermost passages.

In order to unlock the bolt, it must first be acted upon by the second key, and then by the first, it being impossible to unlock it with one key only, after the bolt has been double-locked, as the projections on the bits of the keys are essentially different.

When this improvement is applied to a lock, it is not absolutely requisite to double-lock it, as the ordinary key only, may be used, except where greater security is required.

The last part of these improvements apply to a mode of securing the key-hole, by the application of a seal; which seal is destroyed on attempting to raise the sliding door of the key-hole. At the bottom of the sliding door of the key-hole, on one side, a blunt knife is attached, which projects into a case or enclosure, on one side of the door, in which the seal is placed. The case is closed by a lid, which has an opening in it, secured by small bars; through this the seal may be viewed; and the lid has a spring, by which it is forced open on being set free. By the side of this spring is a catch, which, on the lid being closed, is

caught by a bar placed in the case,—this bar being actuated by a spring. Part of this bar extends into the interior of the lock, and is operated on by the tumblers.

After the bolt has been projected, and the door of the key-hole pulled down, the lid of the case is lifted up, and the seal formed on the inside of the case, the surface being punched to make the wax adhere; the lid of the case is then closed, and is secured by the bar. Now, if a person, in order to pick the lock, raises the sliding door of the key-hole, the blunt knife attached to it, catches against the lower end of the seal, and as it ascends, destroys it. An impression of the seal is likewise prevented from being taken; for to effect that, the lid must be opened, which can only be done by unlocking and raising the lid; to do which the seal is destroyed.

The patentees claim the simplified form and arrangement of the parts of the lock, which renders the same suitable for the application of the simple kind of detector, whereby all the properties and advantages of the most complicated detector lock, heretofore manufactured, are obtained, but with much less workmanship and cost. Also the mode of giving to such single detector locks, the additional security of double locking, by an additional and different key, without any complexity or great increase of workmanship. And lastly,—the mode herein described of applying a seal to secure the key-hole of a lock from being opened, without detection, by the breaking of the seal.—[*Inrolled in the Petty Bag Office, June,* 1834.]

To George Deakin Midgley, *of the Strand, in the county of Middlesex, chemist, and* John Howard Kyan, *of Cheltenham, in the county of Gloucester, Esq., for the invention of an improved mode of extracting or obtaining ammoniacal salts from liquor produced in the manufacture of coal gas.*—[Sealed 4th November, 1837.]

The object of this invention, is to prevent the usual nuisance arising from vapours evolved from manufactories, where the ammonia is extracted from the ammoniacal liquor, resulting from coal gas, according to the modes of manufacturing it now in use.

The patentees submit the ammoniacal liquor to the action of lime, in the following manner:—To every 500 gallons of the liquor, they add 250 lbs. of quick lime, slacked with a sufficient quantity of water. This is poured on to a grating, which is employed for the purpose of preventing large pieces from passing through, and is kept well agitated. It is then placed in a still, in which it is heated to from 170 to 200 degrees of Fahrenheit. The ammonia there becomes evolved, and is passed into an acid bath, by which the salts are condensed and concentrated. When the ammonia, from the mixture in the still, is worked off, the residuum is cleared out and a fresh charge put in.

The patentees have not confined themselves to the use of lime, for the above purposes, although they prefer it for its cheapness; and they do not claim the apparatus for carrying the invention into effect; nor do they claim the simple process of liberating the ammonia, when uncombined with the process of distillation, and producing the salts, by bringing the ammonia into contact with the acid; but, they say, that their invention consists in treating the

ammoniacal liquor in such a manner as to set free the ammonia, and retain the other matters, by submitting the mixture to distillation, and bringing the ammonia evolved into contact with suitable acids, and thereby producing the salts.—[*Inrolled in the Inrolment Office, May,* 1838.]

To JAMES LEMAN, *of Lincoln's Inn Fields, in the county of Middlesex, gentleman, for improvements in making or manufacturing soap,—being a communication from a foreigner, residing abroad.*—[Sealed 12th April, 1836.]

THESE improvements consist in a new mode of perfecting soap, when it is made with cold oil, without the use of fire or boiling; and also when it is made with concrete oil, fat, grease, &c., not in a liquid state, with the use of fire merely to melt the concrete oil, &c. This is effected by the introduction, during the manufacture of the soap, of chloride of lime, of soda, or of potash.

To make the soap with oil, take 108 parts, by measure, of oil, 100 parts, by measure, of solution of chloride of lime, filtered and very clear, of a specific gravity of 1.047 to 1.064, and 45 parts, by measure, of caustic soda leys, of a specific gravity of 1.333.

First, pour the solution of chloride of lime slowly upon the oil, in small quantities, stirring it well, and then pour in the caustic soda leys, in the same manner. The soap being thus compounded, pour it into the moulds, and at the end of three days it will be of a suitable consistency.

When the concrete oil, fat, grease, &c., are used, melt them in a water bath, and proceed with the operation as above.

To make the soap by employing the chloride of soda,

take 108 parts, by measure, of oil, 110 parts of the solution of chloride of soda, of a specific gravity of 1.089, and 30 parts, by measure, of caustic soda leys, of a specific gravity of 1.333. These articles are mixed in the manner before described; and chloride of potash may be used in the same manner.—[*Inrolled in the Inrolment Office, October*, 1836.]

To ARTHUR DUNN, *late of Stamford Hill, in the county of Middlesex, Gent., and now chemist to the Real del Monte Mining Company, for certain improvements in the manufacture of soap.*—[Sealed 24th August, 1838.]

THE patentee takes the ingredients for making soap, in the usual proportions,—say, for instance, in order to make common yellow soap, seven hundred weight of tallow, three hundred weight of palm oil, three hundred weight of resin, and about one hundred and forty or one hundred and fifty gallons of caustic soda leys, of a specific gravity of 1.16,—and the whole are placed in a steam-boiler. The fire being lighted, and the pressure on the valve, such as to allow the temperature in the boiler to rise gradually to about 310° Fahrenheit,—it remains at this height for about one hour; the ingredients are then discharged from the boiler into the pan or frame, and allowed to cool down, when the process of saponification will be found to have taken place.

In order to cause silica to combine more readily with soap, the patentee puts silica with caustic alkaline leys, in the proportion of about one hundred weight of silica to one hundred gallons of caustic alkaline leys, of a specific gravity of 1.16, into a steam-boiler, and raises the temperature to about 310° Fahrenheit. The liquid is kept

under steam pressure of from fifty to seventy pounds on the square inch, for three or four hours, and is then discharged from the boiler, and cooled down. From this a silicate of soda or of potash is obtained, according to the alkali used in solution; and this solution, when silica soap is to be made, is added in any quantity to the other ingredients, when in the pan or frame, after they have undergone the saponifying process, before described, and before they cool down.

The patentee claims, firstly,—performing the saponifying process of soap-making, by heating the ingredients of which the soap is to be composed, in a steam-tight boiler, at the aforesaid temperature, and under pressure.

Secondly,—Digesting silica in a similar boiler, at a high temperature, and under pressure, and the mixing it with the other ingredients in the pan or frame, as aforesaid; whereby he is enabled, in the first case, to cause the perfect combination of the ingredients required for making soap, in a much shorter time, with less waste, and at a less expense, than heretofore; and in the second case, to cause silica to combine more readily with soap, and to ascertain more accurately the quantity of silica to be contained in silica soap.—[*Inrolled in the Inrolment Office, February,* 1839.]

To John Joseph Charles Sheridan, *of Walworth, in the county of Surrey, chemist, for an improvement in the manufacture of soap.*—[Sealed 16th September, 1838.]

This invention consists in the application of a detergent mixture, to be incorporated with the known ingredients

used in the manufacture of soap. This detergent mixture, consisting of caustic soda leys, or caustic potash leys, (substances well known to soap-boilers,) and calcined flint, or calcined quartz, or consisting of caustic soda leys, or caustic potash leys and sand, prepared as after mentioned. Many other substances would furnish silicious matter, but they are either too expensive in themselves, or the difficulty and expense of preparing them, would render them inapplicable; but silicious matter, however obtained, whether from flint, quartz, or sand, will answer the purpose.

A quantity of calcined flint, or calcined quartz, (the common black flint calcined is best,) is reduced, by wet grinding, with horizontal stones, to nearly an impalpable state. To one part of such ground calcined flint, or calcined quartz, mixed with about 20 per cent. of water, is added two parts of caustic soda leys, or caustic potash leys, of a strength indicated by 20° of Beaume's hydrometer, (being the hydrometer generally used by soap-boilers,) or within 1° or 2° thereof. These materials, viz., calcined flint, or calcined quartz, and caustic soda leys, or caustic potash leys, in these proportions, being well mixed, are to be boiled about eight hours, (stirring continually,) till they become incorporated into one homogeneous mass, having the appearance of saponified matter; which appearance will, with very little practice, readily be judged of by a soap-boiler. When this matter has attained this appearance of saponification, it is fit to be applied in the process of soap-making, as after described. In mentioning this matter or substance, it will be described as detergent mixture.

When the ingredients, for making soap, have undergone the usual process, and being perfectly saponified, are in the proper condition to be cleansed, (a term well known to soap-makers,) they should be placed in a pan or vessel, and

the detergent mixture should be progressively poured, pail-full by pail-full, into such pan or vessel, care being observed, after each pail-full has been poured in, to stir or crutch (a term also well known to soap-makers) the whole contents, so as to intimately blend the said detergent mixture, by degrees, with the saponaceous materials, in the manner in which white or curd soap is crutched, according to the present practice.—And it should be stated, that the detergent mixture, when poured in, should be as near the same degree of heat as possible with the saponaceous materials. The most convenient size for the pan or vessel, is one which will contain about half a ton.

In making the detergent mixture for soft soap, (if caustic soda leys be used in making such mixture,) the strength need not be more than 23° of the said hydrometer, although the caustic potash leys may, in the preparation of the detergent mixture for soft soap, be of the strength formerly stated.

The detergent mixture for the manufacture of hard soap, the patentee recommends to be prepared with caustic soda leys. The quantity of the detergent mixture which should be added to a given quantity of saponaceous materials, will depend on the strength required in the soap which is being manufactured.

In curd soap, equal quantities, by weight, of each, will answer best;—in yellow soap, about one-tenth more of the detergent mixture may be used; and in soft soap, two-tenths less:—but the soap boiler may arrive at a most correct judgment of what quantities of the detergent mixture he should use in each kind of soap, by taking a number of equal small measures, or experimental frames, capable of containing about half a pound each, and putting in each a small quantity of the ordinary materials of soap-making, when perfectly saponified and fit to be cleansed,—and inti-

mately blending with each separate measure of soap, different quantities of the detergent mixture, and allowing the same to cool, by which various samples of soap will be produced, each sample having different ascertained quantities of the detergent mixture. From this the soap-maker may judge what course to pursue as to the quantity of the detergent mixture to use, in order to obtain the article he may wish to produce; but the proportions above given will answer generally without any such trial. Having thoroughly crutched the contents of the pan or vessel, (if hard soap is to be made,) the materials are to be poured into the ordinary frames; and if soft soap is being made, they are to be poured into tubs.

The patentee observes, that the pan or vessel may be dispensed with, and the detergent mixture added to the saponaceous materials in the frames or the tubs; but the result is not by any means so beneficial, owing to the difficulty of crutching the materials, when in the frames or tubs, in a proper manner.

If the detergent mixture is to be made of caustic soda leys, or caustic potash leys and sand, the sand should be previously washed, and then mixed with carbonate or subcarbonate of soda or of potash, reduced to powder, in the proportion of one measure, by weight, of sand, to three measures, by weight, of the carbonate or sub-carbonate of soda or of potash, and calcined to fusion, in a reverberatory fnrnace; the result of calcination is drawn off and dissolved in hot water. By injecting a current of carbonic acid gas, the silicious matter of the sand is precipitated, and the liquid, in the state of a carbonate of the alkali used, is drawn off, and the precipitate is then mixed and boiled with the proportion of caustic soda leys, or caustic potash leys, as before mentioned, till the matter, being sufficiently boiled, attains the appearance of saponified matter, as be-

fore stated. The detergent mixture so procured, is added to the saponaceous materials, as hereinbefore described, with reference to the detergent mixture, obtained from flint or quartz. The process just described, is also applicable to flint and quartz uncalcined, but it is best to use these substances as first described.

The patentee does not claim the application of caustic soda leys, or caustic potash leys, in the manufacture of soap; nor the application of various earths, in the manufacture of soap; nor the liquid obtained from the combination of caustic soda leys, or caustic potash leys, with calcined flint or quartz, or with sand, prepared as hereinbefore mentioned; but the application of the detergent mixture, hereinbefore described, in the manufacture of soap.—[*Inrolled in the Inrolment Office, March,* 1839.]

To Samuel Wilkes, *of Darleston, iron-founder, for improvements in the manufacture of hinges.*—[Sealed 21st January, 1840.]

This invention relates to a method of making hinges by casting the two sides or flaps, and also the joint, at one time, on a suitable axis.

Fig. 1, Plate III., is a front view of a hinge, made in this manner; and fig. 2, is a view of the axis of the hinge detached. This axis is furnished with certain washers or plates *a, a, a, a,* which are fixed thereon for the purpose of keeping the parts of the joint separate, and preventing the metal from running solid during the casting process. These washers are thin plates of metal, and when the hinge is cast, they remain as part thereof; but sometimes these discs or washers are made of hard paper or other suitable material, which, when varnished and dusted over, will pre-

vent the melted metal from running together at the hinge joint.

In order to form the moulds for casting these hinges, the patentee takes a common moulding frame, and fills it with sand,—and when turned over, the frame presents an even and smooth surface of sand; he then proceeds to place one or two pattern hinges on the surface, and having pressed the front surface of the hinge into the sand,—iron filling pieces or chills *b, b,* (see figs. 3 and 4, and detached at fig. 5,) are placed in each of the open joints of the pattern hinge. An empty frame is then placed on the first frame, and filled with sand, which must be properly pressed down, in order to produce a proper half mould, and a board being placed thereon, the two frames are turned over, and the first frame of sand removed, thereby leaving the hinge in the second frame with the front upwards; an empty frame is then placed on the second frame and filled with sand, in order to take an impression of the mould which has the pattern hinge therein; and having done so, this frame is removed, and a half mould is produced ready for use. The first, or what is technically called the "odd side mould," is then again placed on the one containing the pattern hinge, and a board placed on the top; and upon turning the two frames over, and removing the upper one, the second half mould is produced ready for use, and having the chills or filling pieces *b, b,* projecting in their proper places.

Fig 3, is a section of the two moulds, with the hinge cast therein; fig. 4, is a plan view of the lower mould, with the ducts for the melted metal to run into the moulds;—fig. 6, is a plan view of the upper mould.

The patentee claims the mode of manufacturing hinges by casting the two flaps with the hinge joints at one time, on to a suitable axis, in the manner above described.—[*Inrolled in the Inrolment Office, July,* 1840.]

To William Herepath, *of the city of Bristol, in the county of Somerset, philosophical chemist, and* James Fitchew Cox, *of the same place, tanner, for their invention of a certain improvement or certain improvements in tanning.*—[Sealed 16th November, 1837.]

These improvements in tanning, consist in the alternate absorption and expression of the tanning liquor from hides or skins, by which the said hides are supposed to become tanned, in a much shorter time than when the ordinary method is employed.

The hides or skins are first properly prepared, by unhairing, fleshing, trimming, &c.; they are then connected or attached to each other by ligatures of strong twine, or in any other convenient manner,—care being taken that the skins are connected together, butt to butt, and shoulder to shoulder, in the manner shewn in fig. 1, Plate III., in order that they should make an even and regular band; or if the skins are connected together, side by side, the butt end of one skin should be laid against the shoulder end of the next. A sufficient number of skins having been thus connected or attached together, they are submitted to the action of the tanning liquid, in the following manner:—

One end of the band of skins is passed between the two rollers *a*, and *b*, of the tanning apparatus, figs. 2 and 3,—fig. 2, being a section, and fig. 3, a front view of the apparatus. The end having been passed between the rollers, it is to be attached to the other end of the band of skins, and thus form an endless band. Rotary motion is then communicated to the apparatus from a steam-engine, by means of the drum *c*, which is mounted on the axle of the roller *b*; a small pinion *d*, is also mounted on the same axle, and takes into a toothed wheel *e*, on the axis of the lower roller

a. Upon actuating the apparatus, the skins (which have been previously arranged in the tan pit) are passed between the two rollers, the upper one of which is weighted. The exhausted or partially exhausted tanning liquor, thereby becomes expressed; and when the skin passes onward from the rollers, it again enters the pit, and absorbs a quantity of fresh tannin.

The patentees do not claim, as new, the apparatus shewn, nor do they confine themselves exactly to the manner above described, of carrying out their invention, as they sometimes have the skins connected in one long band, instead of an endless band; and when the whole of the skins have been operated upon, the apparatus is reversed, and they are all passed back again; they however prefer them to be connected as an endless band; and sometimes they employ only one roller, over which the skins are passed, leaving the weight of the skins alone to express the exhausted tanning liquor; but what they claim, as their invention, is "tanning hides or skins, by connecting or attaching them together, as hereinbefore directed, and submitting them to a quick and repeated alternation of absorption and expression,—absorption of fresh tanning liquor and expression of the liquor when exhausted of its tannin, or partially so,—by means of a continuous application of one, two, or more rollers, placed, adjusted, moved, regulated, and fed or supplied, in the manner hereinbefore directed and described; or placed, adjusted, moved, regulated, and fed or supplied, in any other manner, by which the like effects may be produced; and the frequently repeated absorption by the hides and skins of fresh tanning liquor, and expression from them of exhausted liquor, (which is the essence of our invention,) can be accomplished."—[*Inrolled in the Inrolment Office, May,* 1838.]

To John Potter, *of Ancoats, near Manchester, in the county of Lancaster, spinner, and* William Horsfall, *of Manchester, card-maker, for an improvement or improvements in cards, for carding various fibrous substances; part of which improvements may be used as a substitute for leather.*—[Sealed 20th April, 1839.]

These improvements consist in the manufacture of a new material or substance for receiving the wire teeth of cards, which have hitherto, for the most part, been set in leather.

A woven fabric, of a peculiar construction, is manufactured, the warp of which is composed of a material possessed of the greatest possible strength, and the least elasticity, such as yarn made of flax, hemp, or cotton; which yarn is composed of two or three strands, doubled and twisted together,—and the weft is composed of sheep's wool.

The cloth, after it is woven, is cleaned or scoured, so as to free it from any oil or other impurities, and milled; by which latter process, the fabric is brought to the requisite thickness, by being milled up in width, or in the direction of the thread or yarn of wool.

For most kinds of cards, cloth milled up to such a thickness, that one yard in length by twenty-seven inches in width shall weigh from 14 to 16 ounces avoirdupoise, is the most suitable.

If the cards to be manufactured, are intended for fillet cards, the cloth is next to be torn up lengthwise of the piece, into strips of a suitable width; but if sheet cards are intended, the cloth is to be cut crosswise, or in the direction of the weft, making the usual allowance, as when using leather, for the space on each side for the purpose of affixing the wire cards to the cylinder of the carding engine. A sufficient number of these short pieces of cloth are to be

sewn together at the ends, so as to form a fillet or belt, by which the subsequent operations will be facilitated.

The cloth is now coated with India-rubber, by means of the machine shewn in Plate III. *a, b,* are two leaves of similar form, which move on pivots at *c, c*; *d,* is one of two levers set fast on the pivot *c,* of the leaf *a*; and each lever is furnished with a weight *e,* by which the leaves *a,* and *b,* are pressed together with any required force.

There are two triangular plates, not shewn in the drawing, placed one at either edge of the leaves; and to the back of these plates is rivetted a thin strip of metal, which proceeds downwards between the two leaves *a, b,* in each of which there are two slots, through which proceed two slips of metal *l,* (only one is seen in the drawing,) which are connected together at their extremities, by means of two worm springs.—These two springs, acting on the strips of metal, by the intervention of the slips *l,* bring the two triangular plates of metal towards each other, with any required force.

m, represents a strip of cloth, rolled in a coil on a short cylinder of wood, supported between two bearings;—the whole of the strip of cloth may be drawn off at pleasure, From hence the strip proceeds over the rollers *f,* and *g,* and then passing down between the two leaves *a, b,* and the triangular plates, it receives a charge of the India-rubber varnish or cement at *h,* with which the space, formed by the leaves and triangular plates, is to be kept supplied. It now passes under the roller *i,* and on to a short cylinder of wood *k,* with two discs of metal, placed at either end on its axis, which are required to keep the strip of cloth in its proper place, whilst it is wound into a coil. One of the discs is made fast on the axis, and has a short pin projecting from the face of it, by which the cylinder of wood is carried round; the other disc is moveable, and is set fast on the axis by means of a screw, so that when the coil is

complete, by removing the disc, the coil may be taken off, and, if required, replaced in its former position at *m*, and again drawn through the India-rubber varnish.

The cloth is passed several times through the varnish, and finished by a coating of ochre and glue size; and after being submitted to pressure, will be ready for the card-making machine.

The patentees likewise form another kind of fabric, by cementing woollen cloth, saturated with the India-rubber varnish, to the back of strong cloth, composed of hemp, flax, or cotton.

The patentees claim, first,—The mode of producing a cloth or fabric, by combining sheep's wool and caoutchouc together with a third material, which may be either flax, hemp, or cotton, or a mixture of the same, the fabric being fulled or milled to a proper thickness before applying the India-rubber; such fabric being peculiarly adapted to the making of wire cards, and also a substitute for leather for other purposes.

Secondly,—The application and combination of the woollen cloth, milled or fulled to a proper thickness, and afterwards saturated with caoutchouc, and cemented to the back of strong cloth, composed of flax, hemp, or cotton, as a substitute for leather in the making of wire cards. They do not claim coating fabrics in general with India-rubber, but only the peculiar fabric above described.—[*Inrolled in the Inrolment Office, October,* 1839.]

To Samuel Guppy, *of Bristol, merchant, for improvements in a certain process, and apparatus used in the manufacture of soap.*—[Sealed 1st August, 1839.]

This invention consists in improvements on a patent, which was granted in one thousand eight hundred and thirty-eight,

to Arthur Dunn, entitled "certain improvements in the manufacture of soap."

The present patentee introduces into the boiler, mentioned in Dunn's patent, to every 24 lbs. of tallow 10 pints of caustic soda leys, of a specific gravity of 1.12, and heats the same to 300° Far.; he then adds to them, by means of a force-pump or injecting apparatus, at intervals, about 30 pints of strong caustic soda leys, of a specific gravity of 1.20, to every 24 lbs. of tallow, and keeps it for two hours at a temperature of from 300° to 310° Far., when the saponifying process will be complete, which may be ascertained by drawing off small quantities from the boiler, by means of cocks placed at different heights. The stronger caustic soda leys are contained in a pan or vessel, which communicates, by means of suitable pipes, with the force-pump, by which they are injected into the boiler.

The patentee does not claim anything contained in the patent granted to the said Arthur Dunn; but he claims—

First,—The introduction of leys, in separate portions, at different times, into the close or covered steam-tight vessel or boiler, used by the said Arthur Dunn, in his patent process, during the process of saponification; such leys being of greater strength or specific gravity than the leys first put into the said boiler, with the fatty or oily matters.

Secondly,—The application of a force-pump or other injecting apparatus, with proper pipes, cocks, and valves, communicating with a reservoir of stronger leys, applied to a boiler for the purpose of introducing such stronger leys into the ingredients contained in the said boiler.—[*Inrolled in the Inrolment Office, February,* 1840.]

Scientific Adjudication.

COURT OF COMMON PLEAS.

Before Lord Chief Justice Tindal and a Special Jury, Thursday, February 11th, 1841.

WALTON *v* POTTER AND HORSFALL.

This was an an action for an infringement of a patent granted to the plaintiff, March, 1834, "for certain improvements in cards for carding wool, cotton, silk, and other fibrous substances;" the council for the plaintiff were Sir F. POLLOCK, Mr. Serjeant BOMPAS, and Mr. ADDISON; for the defendants, Sir W. FOLLETT, Mr. Serjeant CHANNELL, and Mr. COWLING.

The cause came forward at the last Middlesex Sittings, but was, by general consent, deferred. The evidence then given, they agreed should be taken from the Judge's notes. The trial lasted two days, and did not terminate until eight o'clock in the evening.

The pleas entered on the record were, firstly,—the invention of Mr. Walton differed materially from that for which the defendants had obtained a patent, in April, 1839; secondly,—that the plaintiff was not the true and first inventor; thirdly,—the said alleged invention was not new, as regards the public use thereof at the time of granting the letters patent; fourthly,—it was not a new manufacture; fifthly,—it was of no public benefit or advantage; sixthly,—the alleged invention was not properly described in the specification; and lastly,—at the time of committing the several supposed grievances, a license was granted to them by the plaintiff.

The usual manner of making cards, previous to this invention, had been to pierce holes into sheets of thick leather, at equal distances, and in these holes to insert the dents or teeth, which are small pieces of iron wire, bent like a hook, and ground to an even height.

The manner in which the plaintiff's cards are made,* is by

* See Vol. XVII., page 363, of the present Series of the London Journal of Arts.

cutting slices of block India-rubber, and fixing the teeth in these slices, giving an elasticity to the teeth, which is considered very desirable,—and at the same time making the card more durable. Linen cloth is affixed to the back of the Indian-rubber by cement, so as to keep the dents or teeth in their proper places, otherwise they might tear out and spoil the card; but when fastened to rollers, the cloth is removed.

Much evidence was taken, and some of it of a very contradictory nature. On the part of the plaintiff there was the evidence of Mr. Brande, Mr. Daniell, Mr. Edward Cooper, and Mr. Carpmael, all of whom gave, as their opinion, that the patent of the defendants is not in any material circumstance different from the plaintiff's; on the contrary, Mr. Farey, Dr. Ure, and Mr. J. T. Cooper, stated, as their opinion, the inventions to be very dissimilar; the chemists, on both sides, stating the reasons which had led them to different conclusions.

The defendants' plan for manufacturing the backs of cards, (for the specification see our present number,) is by providing a cloth, the warp of which must possess the greatest strength, with the least possible elasticity, such as yarn or thread made of hemp, flax, or cotton, which yarn should be made of three strands, doubled and twisted together. When a woollen weft is shot into the warp, the cloth is taken out of the loom, cleaned, milled to the requisite thickness, and immersed several times into a solution of India-rubber varnish; when dry, a mixture of red ochre and weak size is rubbed over the surfaces of the material, and it is then ready for the teeth or dents to be inserted.

The quantity of India-rubber in the two manufactures, was stated to be very different, compared to the cloth;—in the plaintiff's card, the India-rubber is as three to one, and in the defendants' as one to three. The main ground taken by the defendants' counsel was, that the application of India-rubber, to the making of card backs, was not new, but had been used by Mr. Hancock, under a patent right, granted to him in 1825, called a substitute for leather. Many witnesses were called to prove the consumption of this substance for the backs of cards; among others, a Mr.

Hemingway stated that he had made a great quantity, and they had been highly approved of; this took place about eight or ten years since; others had made them also, but they were not brought into general use, as appears by the evidence of the foreman and another, in the employ of Mr. Walton, who were ignorant of the use of India-rubber as a substitute for leather, previous to the plaintiff's patent.

With respect to the invention being improperly described in the specification, the only point of doubt was, whether the patentee intended the wires or teeth to pass through the India-rubber only, or through the cloth also. The difference between the two ways being so great, that in the former the dents or teeth would pull out whilst being used, but in the latter would be fit for the purposes of a good working card.

The Lord Chief Justice, in a very elaborate summing up, directed the Jury to find a verdict for the plaintiff upon the last issue, no evidence having been brought to prove the license alleged to have been granted to the defendants; but left the rest to their consideration. The Jury having one dissentient, retired at eight o'clock, and returned into Court at half-past nine, finding a verdict for the plaintiff on all the issues, with nominal damages.

Scientific Notices.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from page 398, Vol. XVII.)

May 26, 1840.

The President in the Chair.

"On a new Mode of Covering Roofs with Planking."
By William Cubitt, Assoc. Inst. C. E.

The roof itself is framed in the usual manner with principals and purlins, but without rafters. The boards, intended for the

covering, are cut, by means of a circular saw, from planks 7 inches wide by 2½ inches thick, in such manner that each plank makes two boards, the one tapering from its centre towards the edges, the other from its edges towards the centre. The hollow boards are laid side by side, at intervals of 4½ inches, and nailed to the purlins by their centres only, so as to admit of shrinking; the intervening spaces are then covered by the other boards, overlapping 1½ inch on each edge, and nailed in like manner. The covering thus formed presents a series of alternate elevations and depressions, longitudinally from the ridge to the gutter, and consequently the rain falls off very rapidly, and a roof so constructed is easily kept water-tight. The author conceives this to be the most economical mode of using timber for covering, and he has adopted it extensively. The communication was accompanied by a model of the roof, and specimens of the boards as they are left by the saw.

A letter was read from Ardaseer Cursetjee, of Bombay, inviting a discussion on the relative advantages of long and short connecting rods for marine engines. He was induced to make inquiry on this subject from some observations in a communication to the Institution, relative to the engines of the steam tug the "Alice" (Minutes of Proceedings, page 54). In that paper, their superiority is in part attributed to the increased length of the connecting rods. This is the point upon which he requests information, as he conceives, that the power of the piston upon the crank is the same, whatever may be the medium through which it is transmitted, and the effect to be the same throughout a complete revolution, whether the connecting rod be long or short, except that from the increased angle of a very short connecting rod, some additional friction is thrown upon the joints.

On the general construction of the engine of the "Alice," he remarks, that engines of similar form are now used for pumping at the Thames Tunnel, under Mr. Brunel's direction; and that a pair of engines of this kind were built by Messrs. Seaward, 13

years ago, for the "Staadt Francfort" steam boat, to ply between Francfort and Coblentz; in this instance, the cylinders were firmly fixed to the bed-plate and sleepers, with the cross bars above the cylinders, thus having one connecting rod only, leading to the cranks, which he considers a superior arrangement to that of the engines of the "Alice."

A drawing of the engines of the "Staadt Francfort" accompanies the communication.

A letter was read from Mr. John Cooper, of Dover, describing the effect of the worm (*Teredo navalis*) on several kinds of timber which had been exposed to the action of sea water. The kinds of timber on which the experiments were made, were fir, English oak, and African oak; specimens of each sort, some Kyanized and the others unprepared, having been tried under exactly similar circumstances on the piles of the south pier of Dover harbour. The results show that Kyanizing timber does not, in any degree, protect it; as, after exposure from December, 1837, until May, 1840, it was found that the worm made equal ravages among all the specimens. The author also tried the process of saturating timber with copperas water, but did not find any good result from it. In July, 1835, he placed under water some 2-inch oak planks which had been prepared with copperas; and on examining them in May, 1840, they were found to be as much attacked by the worm as the worst specimens of unprepared fir timber which had been exposed for a similar length of time. The African oak resisted the attack of the worm better than either fir or English oak.

It was stated, that Teak timber resisted the attacks of the worm and of the white ant, which destroy all other kinds of timber. It is, however, liable to injury from the attacks of barnacles.

"On the Corrosion of Cast and Wrought Iron in Water." By Robert Mallet, Assoc. Inst. C. E., &c.

This communication is one of those forwarded to the Institution in consequence of the Council having considered this subject a suitable one to compete for the Telford Premiums; and the author having been long engaged in making experiments on this subject, at the request of the British Association, refers, in the introductory part of this paper, to the contents of that report, which may be viewed as a "précis" of the state of our knowledge on the subject to the year 1839, together with original researches, forming the basis of the present results. This communication is accompanied by a most elaborate set of tables of results; but these laborious investigations being yet in progress, the author directs his special attention to so much only of the subject as may be necessary for their elucidation, divesting his remarks, as much as possible, of a purely chemical character, and confining them to those practical conclusions which are of immediate use and importance to the engineer.

The tables of results are altogether twelve in number. The first five contain the data and results of the chemical or corroding action of sea and fresh water on cast and wrought iron, under five several conditions, during a period of a year and ten months; and these five series of experiments are so co-ordinate with each other, as to form one connected and comparable whole, whence the relative rates and absolute amounts of corrosion of cast and wrought iron—by, 1. clear sea water, 2. foul sea water, 3. clear sea water, at temperature 115° F., 4. foul river water, and 5. clear river water—may be ascertained. The corrosive action of water and air, combined, produces on the surface of cast or wrought iron a state of rust, possessing one of the five following characteristics:—1. Uniform, 2. uniform with plumbago, 3. local, 4. local pitted, 5. tubular—or of two or more of these characteristic conditions in combination; these facts for 82 different specimens of British and Irish cast iron—together with their original external characters, mode in which they were cast, specific gra-

vity, dimension and weight before and after immersion, loss of weight per square inch of surface, this loss referred to a standard bar, and the weight of water absorbed for clear sea water—compose Table I. The four subsequent tables contain similar results for specimens of iron immersed under the other four conditions mentioned above. These five tables contain also the results of the corrosion of certain cast irons, protected by either of ten several paints or varnishes, the results of which are comparable with those for the unprotected iron. Table VI. exhibits a general comparison of the results set forth in the preceding tables, for specimens of iron 1 inch thick, and reduced to one common or equal period of immersion. Table VII. shows the *average loss* of all varieties of cast iron experimented on per square inch of surface. Table VIII. the average calculated amount of corrosion (assumed uniform) of various specimens of cast and wrought iron per superficial foot of surface, at the end of one century. From these tables it appears, that the metallic destruction or corrosion of the iron, is a maximum in clear sea water of the temperature of 115° F.—that it is nearly as great in foul sea water—and a minimum in clear fresh river water.

Iron, under certain circumstances, is subject to a peculiar increase of corrosive action—as, for instance, cast-iron piling at the mouth of tidal rivers—from the following cause. The salt water being of greater density than the fresh, forms, at certain times of tide, an under current, while the upper or surface water is fresh; these two strata of different constitution coming in contact with the metal, a voltaic pile of one solid and two fluid elements is formed: one portion of metal will be in a positive state of electrical action with respect to the other, and the corrosive action on the former portion is augmented. The lower end of an iron pile, for instance, under the circumstances just mentioned, will be positive with respect to the other, and the corrosion of the lower part will be augmented by the negative state of the upper portion, while the upper will be *itself* preserved in the same proportion. From this theoretical view may be deduced the important practical conclusion, that the lower parts of

all castings, subject to this increased action, should have increased scantling.

The increased corrosive action of *foul sea* water, may be referred to the quantity of hydrosulphuric acid disengaged from putrifying animal matter in the mud, converting the hydrated oxides and carbonate of iron into various sulphurets, which again are rapidly oxidized further under certain conditions, and becoming *sulphates*, are washed away. Hence the rapid decay of iron in the sewage of large cities, and of the bolts of marine engines exposed to the bilge water. The corrosive action being least in fresh water, may be partly referred to this being a worse voltaic conducting fluid than salt water.

It appears also that wrought iron suffers the greatest loss by corrosion in hot sea water; which fact has led the author to inquiries, with reference to marine boilers, at what point of concentration of the salt water, whether when most dilute, after the common salt has begun to deposit, or at a farther stage of concentration, the corrosive action on wrought iron is the greatest, and he points out the important practical use which can be made of this information. It appears also, that the removal of the exterior *skin* of a casting greatly increases the corrosive action of salt water and its combined air, so that the index of corrosion, under these circumstances, is not much less than that of wrought iron, and in clear river water is greater.

It farther appears, that chilled cast iron corrodes faster than the same sort of cast iron cast in green sand, and that the size, scantling, and perhaps form of a casting, are elements in the rate of its corrosion in water. The explanation of these facts is to be found in the want of homogeneity of substance, and the consequent formation of numerous voltaic couples, by whose action the corrosion is promoted. It is also observable that the corroded surface of all these chilled specimens, is tubular.

It appears also that, in castings of equal weight, those of massive scantling have proportionately greater durability than those of attenuated ribs and feathers. Hence appears also the great

advantage of having all castings, particularly those intended to be submerged, *cooled in the sand*, so as to insure the greatest possible uniformity of texture. The principles now stated, afford an explanation of the fact often observed, that the back ribs of cast iron sheet piling decay much faster than the faces of the piles. It is also probable that castings in dry sand and loam will, for these reasons, be more durable than those cast in green sand. The general results of all these experiments gives a preference to the Welsh cast iron for aquatic purposes, and to those which possess closeness of grain. Generally, the more homogeneous, the denser and closer grained, and the less graphytic, the smaller is the index of corrosion for any given specimen or make of cast iron.

The author next proceeds to the important question of the protection afforded by paints and varnishes. White lead perishes at once in foul water, both fresh and salt; and caoutchouc dissolved in petroleum appears the most durable in hot water; but asphaltum varnish or boiled coal tar, laid on while the iron is hot, lasts under all circumstances. The zinc paint, which is now so much noted as an article of commerce, the author has analyzed, and states its composition as—

Sulphuret lead . . .	9.05
Oxide zinc	4.15
Metallic zinc	81.71
Lesqui oxide iron . . .	0.14
Silica	1.81
Carbon	1.20
Loss	1.94
	100.

It may, *a priori*, be considered likely to produce a most excellent body for a sound and durable paint under water. The black oxide of manganese has no advantages but that of being a powerful drier. The defects of all oil paints arise from the instability of their bases; the acids which enter into the constitution of all fixed oils, readily quit their weakly positive organic bases to

form salts with the oxides of the metal on which they may be laid. Hence we must look for improvements in our paints to those substances among the organic groups which have greater stability than the fat or fixed oils, and which, in the place of being acid or Haloid, are basic or neutral. The heavy oily matter obtained from the distillation of resin, called "resenien," and eupion, obtained from rapeseed oil, have valuable properties as the bases of paints.

Tables IX. and X. contain the results as to the corrosion of cast iron in sea water, when exposed in voltaic contact with various alloys of copper and zinc, copper and tin, or either of these metals separately, per square inch of surface. It appears that neither brass nor gun metal has any electro-chemical protective power over iron in water, but on the contrary, promotes its corrosion. This question is only a particular case of the following general question: viz., if there be three metals, A. B. C. whereof A. is electro-positive, and C. electro-negative, with respect to B., and capable of forming various alloys, 2 A+C....A+C.... A+2 C; then if B. be immersed in a solvent fluid in the presence of A., B. will be electro-chemically preserved, and A. corroded, and *vice versa.* If B. be so immersed in the presence of C., B. will be dissolved or corroded, and C. electro-chemically preserved; the amount of loss sustained in either case being determined according to Faraday's "general law of Voltaequivalents." The tables show that the loss sustained by cast iron in sea water, as compared to the loss sustained by an equal surface of the same cast iron in contact with copper, is 8·23 : 11·37; and when the cast iron was in contact with an alloy containing 7 atoms of copper and 1 of zinc, the ratio was 8·23 : 13·21; so that the addition in this proportion of an electro-*positive* metal to the copper, produces an alloy (a new metal, in fact) with higher electro-negative powers, in respect to cast iron, than copper itself. The author discusses many results equally remarkable, and is therefore enabled to suggest, by its chemical notation, the alloy of "no action," or that which, in the presence of iron and a solvent, would neither accelerate nor retard its solution, one of the com-

ponents of this alloy being slightly electro-negative, and the other slightly electro-positive, with respect to cast iron. These results will also enable some advances to be made towards the solution of the important problem proposed by the author in his former report, viz., " the obtaining a mode of electro-chemical protection, such that while the metal (iron) shall be preserved, the protector shall not be acted on, and the protection of which shall be invariable."

Table X. exhibits especially the results of the action of sea water on cast iron, in the presence of copper and tin, or their alloys. It appears that copper and tin being *both* electro-negative with respect to cast iron, all their alloys increase or accelerate the rate of corrosion of cast iron in a solvent, though in very variable degrees; the maximum increase is produced by tin alone, thus indicating that this metal (contrary to what was previously believed) is more electro-negative to cast iron than copper. Hence the important practical deduction, that, where submerged, works in iron must be in contact with either alloy, viz., brass or gun metal; common brass, or copper and zinc, is much to be preferred. These experiments will also serve to demonstrate the fallacy of many of the patented so-called preservatives from oxidation, which are brought before the public with so much parade.

The author lastly proceeds to the subject of the specific gravity of cast iron, tables of which are added to the preceding. The specific gravities here recorded, were taken on equal sized cubes of the several cast irons cut by the planing machine, from bars of equal size, cast at the same temperature, in the same way, and cooled in equal times. Many of these results differ considerably from those given by Dr. Thompson and Mr. Fairbairn; which the author refers to the probability that those of Dr. Thompson were taken from pieces of the raw pig, and those of Mr. Fairbairn by weighing in air equal bulks, cut from the mass by the chisel and file, by which latter process the volume is liable to condensation. The experiments of Mr. Fairbairn and Mr. Eaton Hodgkinson, seem to shew that the ultimate strength of cast-iron is in the ratio of some function of the specific gravity dependant

upon the following conditions: viz. 1, the bulk of the casting; 2, the depth or head of metal under which the casting was made; 3, the temperature at which the iron was poured into the mould; and 4, the rate at which the casting was cooled.

Table XI.—All the irons experimented on, are arranged in classes, according to the character of the fracture; for which purpose the terms—1, silvery, 2, micaceous, 3, mottled, 4, bright grey, 5, dull grey, and 6, dark grey, have been adopted by the author as a sufficient basis on which to rest a uniform system of nomenclature for the physical characters of all cast irons, as recognisable by their fracture; and it is to be wished that experimenters in future would adopt this or some other uniform system of description, in place of the vague and often incorrect characteristics commonly attached to the appearance of the fracture of cast iron.

The twelfth and last table contains the results of a set of experiments on the important subject of the increase of density conferred on cast iron, by being cast under a considerable head of metal, the amount of which condensation had not been previously reduced to numbers. It shows this increase of density in large castings, for every 2 feet in depth, from 2 to 14 feet deep of metal.

A very rapid increase of density takes place at first, and below 4 feet in depth a nearly uniform increment of condensation.

The importance of these results is obvious; for, if the ultimate cohesion of castings is as some function of their specific gravity, the results of experiments in relation to strength, *made on castings of different magnitudes, or cast under different heads*, can only be made comparable by involving the variable specific gravities in the calculation.

List of Patents

Granted by the French Government from the 1st of January to the 31st of March, 1840.

PATENTS FOR FIFTEEN YEARS.

To Bourbon, represented in Paris by M. Perpigna, advocate of the French and Foreign Office for Patents, Rue Choiseul, No. 2, ter: for the preservation of vegetable substances, either ligneous or textile.

Clark, represented in Paris by M. Perpigna, advocate, for improvements in locomotives.

Coles, represented in Paris by M. Perpigna, advocate, for a new porte carbine.

Davies, of Manchester, represented in Paris by M. Perpigna, advocate, for improvements in looms.

Billet, represented in Paris by M. Perpigna, advocate, for improvements in mechanism for preserving carriages from being overturned.

Bourgeois, of Tangues, (Orne) represented in Paris by M. Perpigna, advocate, for improvements in locks.

Burnett, of London, represented in Paris, by M. Perpigna, advocate, for machinery for working wood.

Guyot-Duclos, represented in Paris by M. Perpigna, advocate, for improvements in the distillation of coal.

Perrot, of Rouen, for a press for lithographic and typographic impressions.

Few, of London, for improvements in locomotives.

Sorel, of Paris, for novel applications of iron preserved from oxidation.

Poole, of Paris, for improvements in weaving.

Royer, of Paris, for a furnace for working iron, and applicable to the fusion of glass.

Wayte, of Basford, (England,) for improvements in wheels of steam boats.

Sormani and Lagoutte, of Lacroix, for paddle wheels, applicable to steam navigation.

Cuningham, of Paris, for improvements in spinning machines.

Bonifas-Cabane, and Paul, Jun., of Anduze, (Gard,) for an accelerating axletree.

Serveille, of Paris, for a new lock for carriages

Rampal and Gaulofret, of Paris, for an improvement in the manufacturing of soap.

Duquesne, of Valenciennes, for a machine for flatting and engraving glass.

Rommelnere, of Gand, (Belgium,) for a mode of manufacturing alum.

Demont and Follet, of Paris, for imitation stone for architectural ornaments.

Gandillot and Roy, of Paris, for windows in tabular iron.

Boutel, of the Batignolles, near Paris, for an improved water-closet.

Borrodaile, of London, for a process for raising vessels, and other objects sunk in water.

Verry, of Paris, for a process for making bread.

Count de Baurepaire, and Loos, of Paris, for extracting sugar from cane and beetroot.

Lefaucheux, of Paris, for a new lock for carriages.

Moll, of Colmar, for a flour mill in cast-iron.

PATENTS FOR TEN YEARS.

To Trésel, of St. Quentin, represented in Paris by M. Perpigna, advocate of the French and Foreign Office for Patents, Rue Choiseul, 2 ter: for a portable metrical measure.

Sudds, Adkins, and Barker, represented in Paris by M. Perpigna, advocate, for hydraulic wheels.

Amiot, represented in Paris by M. Perpigna, advocate, for an instrument for curling hair.

Amet, Conscience, and Morel, represented in Paris by M. Perpigna, advocate, for an improved plummer box.

Tachouzin, of Mont de Marsan, represented in Paris by M. Perpigna, advocate, for the manufacturing essence of turpentine.

Dumotier and Baza, of Vadencourt, represented in Paris by M. Perpigna, advocate, for the manufacturing of shawls.

Dubois, represented in Paris by M. Perpigna, advocate, for surgical instruments.

Gallice, of Epernay, represented in Paris by M. Perpigna, advocate, for improvements in the preparation of sparkling wines.

Ferrand, of Angers, represented in Paris by M. Perpigna, advocate, for an improved baking oven.

Gracien and Houet, of Hames, represented in Paris by M. Perpigna, advocate, for an improved extirpating instrument.

Lecoffre, of Barenton, for a flatting machine.

Parpaite, Sen., of Messincourt, (Ardennes,) for improved looms.

Geslot Menier, of Tours, for a new snuff box.

Hazard, of Paris, for a fountain stove.

Noakes, of Paris, for an improved paving.

Johnson, of London, for improved musical instruments.

Poole, of Paris, for improvements in stoves.

Poole, of Paris, for new frames for elastic stuffs.

Bracquemont and Falton, of Paris, for new trousers straps.

Parker, of London, for restoring of matters used for the clarifying of syrups.

Lawford-Ackland, of Paris, for metallic alloy for tubes, &c.

Tripot, of Auteuil, near Paris, for painted paper, made by machinery.

Conty, of Abilly, (Indre & Loire,) for improvements in flour mills.

De Grenier, of St. Omer, (Pas de Calais,) for a steam boiler.

Lucas Brothers, of Rheims, for a winder, fit for the spinning of worsted.

Aubril, of Paris, for powder for sharpening razors.

Sbodio, of Marseilles, for a new motive power.

Evangelista, of Angoulême, for an anti-febrile elixir.

Ferray and Co., of Paris, for improvements in mills.

Ferry, of Paris, for a new kind of spoons and forks, in gold, silver, &c.

Canning, of Paris, for an improved screw-jack.
Popp, of Paris, for improvements in the making of hats.
Mairet, of Morlaix, for marbled paper.
Cazal, of Paris, for an improved umbrella.
Espit, of Lyons, for a new billiard table.
Messire, of Chalons, (Sur Saône,) for an improved fire-engine.
Antoine and Jusseaume, of Paris, for an improved stove for preparing the residuum in the manufacturing of starch.
Dujardin, of Lille, for an improved truss.
Lasvade, of Paris, for a machine for preventing ships from sinking.
Bezanger, of Paris, for a new ink.
Chainay, of Maestricht, for a new steam-engine.
Madame Bex, of Paris, for an application of bitumen to the lining of walls, for protecting them against damp.
Daubigny, of Paris, for an improved paint.
Coste, of Limoux, (Aude,) for an improved spinning card.
Okey, of Paris, for improvements in the making of paper.

PATENTS FOR FIVE YEARS.

To Gros, of Mèze, represented in Paris by M. Perpigna, advocate, for impermeable shoes
Mdlle. Guersant, of Caen, represented in Paris by M. Perpigna, advocate, for open worked stitches upon cotton lace.
Fergusson and Bornique, represented in Paris by M. Perpigna, advocate, for improvements in looms.
Mohrenberg, of Berlin, represented in Paris by M. Perpigna, advocate, for an improved mitre for chimnies.
Roblin, of Corseulle, represented in Paris by M. Perpigna, advocate, for universal motive power.
Milhas, of Courneau, represented in Paris by M. Perpigna, advocate, for a machine for extracting pips from grapes.
Legoff, of Brest, represented in Paris by M. Perpigna, advocate, for an improved pall for stopping chains on board ship.
Gunon, of St. Etienne, represented in Paris by M. Perpigna, advocate, for an improved batten for weaving looms.

Garcenot, of Dijon, represented in Paris by M. Perpigna, advocate, for an improved califyer.

Martin and Co., of Toulouse, represented in Paris by M. Perpigna, advocate, for improvements in pianos.

Richer, of Anzin, (Nord,) for an oven for baking bread with coal.

Bonnet, of Paris, for a comparative table of old and new measures.

Wiesnegg and Turnel, of Paris, for an apparatus for making coffee, tea, &c.

Touzet, of Amiens, for an improved truss.

Canning, of Paris, for a new method of renovating the air in the shafts of coal mines.

Cabirol, of Bordeaux, for a swimming belt.

Tronchon, of Paris, for looms for manufacturing tissues, woven obliquely.

Briers-Senior, of Auteuil, (Seine,) for an improved manner of making gelatine.

Barle and Defrémont Brothers and Co., of Paris, for gauffred leather for trimming hats.

De Bergue-Spréfico and Co., for a paper-cutting machine.

Busnel, of Paris, for a box, called "portable tête à tête."

Madame Dulac, of Paris, for a process for making bread.

Piet Brothers, of Paris, for a mode of cutting corks and bungs.

Progin, of Paris, for a typographical pen.

Simonet, of Paris, for buckles and buttons for trousers straps.

Bonnot, of Paris, for means of replacing engraving.

Guerlain, of Paris, for a cosmetic, called "Gowland's Lotion."

Geron and Mitaine, of Paris, for an opera glass.

Bonnet and Villermé, of Paris, for a new process for gilding without mercury.

Laborne, of Paris, for a new composition of bitumen.

Molinié, of St. Pons, for improvements in paper machines.

Reintjes, of Paris, for mechanism, to be used instead of the iron pegs in pianos.

Lefort, of Rouen, for a mode of manufacturing Mechlin and *point de champ* lace, upon bobbin-net frames.

Jouani, of Paris, for a new slide for umbrellas.

Jacob, of Paris, for a new fur for shoes.

Fichet, of Meaux, for an apparatus to be used in the construction of rail-roads.

Voizot, of Chatillon, sur Seine, for an apparatus for changing the action of engines used in navigation.

Tanerer, of Lyons, for a foot-stool and spitting-dish.

Séguin and Gausser, of Paris, for a new method of dressing straw hats.

Cousin, of Paris, for waggons, with moveable frames.

De Bergue, of Paris, for a machine for paring leather.

Fages, of Toulouse, for a britska, changing into a tilbury or cabriolet.

Perroteau, of Lyons, for a measure for men's coats.

Gugnon, of Havre, for an apparatus for bleaching.

Tanerer, of Paris, for an improved work table.

Seytre, of St. Etienne, for brocading batten with three shuttles.

Lemercier and Tirpenne, of Paris, for a method of drawing.

Dida, of Paris, for a mode of manufacturing iron vases.

Clerville, of Paris, for improved wigs.

Michaut, of Chatillon, sur Seine, for a calculating machine.

Santune, of Paris, for a metallic trousers strap.

Blay and Quantier, of Paris, for suspenders in caoutchouc tissue.

Mailhat, of Paris, for an improved *eau de toilette.*

Lepinois, of Neuville Day, Ardennes, for a new plough.

Noble and Clark, of Paris, for a machine for cutting rags.

Raincelin, of Neuilly, near Paris, for an improved spring hinge, for doors or frames.

Mathieu Carrot, of Paris, for a tilting oven for baking bread.

Madame Trouelhas, of Marseilles, for crystallized soda and potash, extracted from olive oil cake.

Parry, of Paris, for a machine for grinding colours.

Longueville, of Paris, for a new method of constructing the bodies of carriages.

List of Patents

That have passed the Great Seal of Ireland, from the 1st of January, to the 17th of February, 1841.

To Robert Edmund Morrice, of King William-street, in the city of London, merchant, for certain improvements in the arrangement and construction of ships' hearths, or apparatus for cooking; and for obtaining distilled or pure water from salt or impure water,—being a communication from a foreigner residing abroad.—Sealed 5th January—6 months for inrolment.

William Hukling Burnett, of Wharton-street, Bagnigge Wells-road, in the county of Middlesex, gent., for improved machinery for cutting and working wood.—Sealed 11th January—6 months for inrolment.

Henry Hawker Bourne, of Tenenure, in the county of Dublin, engineer, for a machine for cleaning highways, streets, or roads.—Sealed 16th January—6 months for inrolment.

John Annes, of Plymouth, in the county of Devon, painter, for an improved method of making paint from materials not before used for that purpose.—Sealed 16th January—6 months for inrolment.

Samuel Wilkes, of Darleston, in the county of Stafford, iron-founder, for improvements in the manufacture of hinges.—Sealed 10th February—6 months for inrolment.

Henry Hind Edwards, of Nottingham-terrace, New-road, in the county of Middlesex, engineer, for an invention of improvements in evaporation,—being a communication from a foreigner, residing abroad.—Sealed 10th February—6 months for inrolment.

Richard Beard, of Egremont-place, New-road, in the county of Middlesex, gent., for improvements in printing calicoes and other fabrics,—being a communication from a foreigner, residing abroad.—Sealed 10th February—6 months for inrolment.

William Crane Wilkins and Mathew Samuel Kendrick, of Long Acre, in the county of Middlesex, lamp manufacturers, for certain improvements in lighting, and in lamps.—Sealed 13th February—6 months for inrolment.

Matthew Uzielli, of King William-street, in the city of London, merchant, for improvements in impregnating and preserving wood and timber, for various useful purposes,—being a communication from a foreigner, residing abroad.—Sealed 17th February—6 months for inrolment.

List of Patents

Granted for Scotland subsequent to January 22nd, 1841.

George Jameson Cordes, and Edward Locke, of Newport, Monmouthshire, for a new rotary engine.—Sealed 28th January.

Samuel Hall, of Basford, Nottinghamshire, civil engineer, for improvements in the combustion of fuel and smoke.—Sealed 28th January.

John Dickenson, of Bedford-row, Holborn, engineer, for certain improvements in the manufacture of paper.—Sealed 1st February.

William Mc Murray, of Kenleith Mills, near Edinburgh, papermaker, for certain improvements in the manufacture of paper. —Sealed 3rd February.

William Henson, of Allen-street, Lambeth, engineer, for improvements in machinery for making or producing certain fabrics, with threads or yarns, applicable to various useful purposes.—Sealed 4th February.

Nathaniel Lloyd, pattern designer, and Henry Rowbotham, calico printer, both of Manchester, for certain improvements in thick-

ening and preparing colours for printing calicoes and other substances.—Sealed 9th February.

James Mc Lellan, of the city of Glasgow, manufacturer, for an improved combination of materials for umbrella and parasol cloth.—Sealed 9th February.

John Clark, of Islington, in the county of Lancaster, plumber and glazier, for an hydraulic double-action force and lift pump,—being partly a foreign communication and partly his own.—Sealed 9th February.

Charles May, of Ipswich, in the county of Suffolk, engineer, for improvements in machinery for cutting and preparing straw, hay, and other vegetable matters.—Sealed 12th February.

James Johnson, of Glasgow, for certain improvements in machinery for the manufacture of frame-work knitting, commonly called hosiery; and for certain improvements in such frame-work knitting, as hosiery.—Sealed 15th February.

George Holworthy Palmer, of Surry-square, civil engineer; and Charles Perkins, of Mark-lane, London, merchant, for an improved construction of pistons and valves for retaining and discharging liquids, gases, and steam.—Sealed 16th February.

Miles Berry, of the Office for Patents, 66, Chancery-lane, London, patent agent, for certain improvements in looms for weaving,—being a foreign communication.—Sealed 20th February.

Moses Poole, of Lincoln's Inn, for improvements in tanning,—being a foreign communication.—Sealed 22nd February.

New Patents

SEALED IN ENGLAND.

1841.

To Charles Schafhoutl, of Swansea, Doctor of Medicine; Edward Olive Manby, of Parliament-street, civil engineer; and John Manby, of the same place, civil engineer, for improvements in the construction of puddling, balling, and other sorts of reverberatory furnaces, for the purpose of enabling anthracite stone-coal, or culm, to be used therein as fuel.—Sealed 30th January—6 months for inrolment.

James Mac Lellan, of the city of Glasgow, manufacturer, for improved combination of materials for umbrella and parasol cloth.—Sealed 30th January—6 months for inrolment.

Ezra Jenks Coates, of Bread-street, Cheapside, merchant, for improvements in the forging of bolts, spikes, and nails, —being a communication.—Sealed 30th January—6 months for inrolment.

Henry Pape, of Great Portland-street, Piano-forte manufacturer, for improvements in castors.—Sealed 1st February—6 months for inrolment.

Charles Hood, of Earl-street, Blackfriars, iron merchant, for improvements in giving signals.—Sealed 1st February —6 months for inrolment.

William Wilkinson Taylor, of Burrowfield House, Westham, Essex, gent., for improvements in buffing apparatus for railway purposes.—Sealed 1st February—6 months for inrolment.

Dominic Frick Albert, of Cadishead, Manchester, LL.D. for an improved or new combination of materials and processes in the manufacture of fuel.—Sealed 1st February—6 months for inrolment.

Francis Sleddon, Jun., of Preston, machine maker, for certain improvements in machinery or apparatus for roving, slubbing, and spinning cotton and other fibrous substances. —Sealed 2nd February—6 months for inrolment.

William Ward Andrews, of Wolverhampton, ironmonger, for certain improved methods of raising and lowering windows and window blinds, and opening and shutting doors; which are also applicable to the raising and lowering of maps, curtains, and other articles.—Sealed 2nd February —6 months for inrolment.

Thomas Young, of Queen-street, London, merchant, for improvements in furnaces or fire-places, for the better consuming of fuel.—Sealed 3rd February—6 months for inrolment.

William Hancock, Jun., of King-square, Middlesex, accountant, for an improved description of fabrics, suitable for making friction gloves, horse brushes, and other articles requiring rough surfaces.—Sealed 3rd February—6 months for inrolment.

Joseph Bunnett, of Deptford, engineer, for certain improvements in locomotive engines and carriages.—Sealed 3rd February—6 months for inrolment.

John Cartwright, of Loughborough, manufacturer; Henry Warner, of the same place, manufacturer; and Joseph Haywood, of the same place, frame-smith, for improvements upon machinery commonly called stocking-frames or framework knitting machinery.—Sealed 4th February —6 months for inrolment.

Thomas Griffiths, of Birmingham, tin plate worker, for certain improvements in such dish covers as are made with iron, covered with tin.—Sealed 8th February—6 months for inrolment.

James Thorburn, of Manchester, machinist, for certain improvements in machinery for producing knitted fabrics.—Sealed 8th February—6 months for inrolment.

William Ryder, of Bolton, roller and spindle maker, for certain improved apparatus for forging, drawing, moulding, or forming spindles, rollers, bolts, and various other like articles, in metal.—Sealed 8th February—6 months for inrolment.

Thomas Fuller, of Salford, machine maker, for certain improvements in machinery or apparatus for combing or preparing wool, or other fibrous substances,—being partly a communication.—Sealed 8th February—6 months for inrolment.

Elisha Oldham, of Cricklade, Wilts, railroad contractor, for certain improvements in the construction of turning tables, to be used on railways.—Sealed 8th February—6 months for inrolment.

Charles Green, of Birmingham, gold plater, for improvements in the manufacture of brass and copper tubes.—Sealed 8th February—6 months for inrolment.

William Wigston, of Salford, engineer, for a new apparatus for the purpose of conveying signals or telegraphic communications.—Sealed 8th February—6 months for inrolment.

Joseph Scott, of Great Bowden, Market Harborough, timber merchant, for improvements in constructing railways, and in propelling carriages thereon; which improvements

are applicable to raising and lowering weights.—Sealed 8th February—6 months for inrolment.

James Johnston, of Willow Park, Greenock, Esq., for improvements in obtaining pictures or representations of objects.—Sealed 15th February—6 months for inrolment.

William Henry Fox Talbot, of Locock Abbey, Wilts, Esq., for improvements in obtaining pictures, or representations of objects.—Sealed 8th February—6 months for inrolment.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, mechanical draftsman, for improvements in obtaining a concentrated extract of hops, which the inventor denominates "Humuline,"—being a communication.—Sealed 15th February—6 months for inrolment.

Theophilus Smith, of Attleborough, Norfolk, farmer, for certain improvements in ploughs.—Sealed 15th February—6 months for inrolment.

James Whitelaw and George Whitelaw, engineers, of Glasgow, for a new mode of propelling vessels through the water, with certain improvements on the steam-engine, when used in connection therewith; part of which improvements are applicable to other purposes.—Sealed 15th February—6 months for inrolment.

Philip W. Phillips, of Clarence-place, Bristol, Gent., and W. Bishop Peck, of Broad-street, Bristol, wine merchant, for improvements in four-wheeled carriages.—Sealed 15th February—6 months for inrolment.

James Ransom and Charles May, of Ipswich, machine makers, for improvements in the manufacture of railway chairs, railway and other pins or bolts, and in wood fasten-

ings and trenails.—Sealed 15th February—6 months for inrolment.

William Scamp, of Charlton-terrace, Woolwich, surveyor, for an application of machinery to steam vessels for the removal of sand, mud, soil, and other matters from the sea, rivers, docks, harbours, and other bodies of water.—Sealed 16th February—6 months for inrolment.

William Samuel Henson, of Allen-street, Lambeth, engineer, for certain improvements in steam-engines.—Sealed 16th February—6 months for inrolment.

George Edward Noone, of Hampstead, engineer, for improvements in dry gas meters.—Sealed 18th February—6 months for inrolment.

William Orme, of Stourbridge, iron-master, for improvements in the manufacture of cofered spades, and other cofered tools.—Sealed 18th February—6 months for inrolment.

John Collard Drake, of Elm-tree road, St. John's Wood, land surveyor, for improvements in scales used in drawing and laying down plans—Sealed 18th February—6 months for inrolment.

Anthony Bernhard Von Kathen, of Kingston upon Hull, engineer, for certain improvements in fire-grates, and in parts connected therewith, for furnaces for heating fluids.—
—Sealed 22nd February—4 months for inrolment.

William Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for improvements in the process of, and apparatus for, purifying and disinfecting greasy and oily substances or other matters, both animal and vegetable,—being a communication.—
—Sealed 22nd February—6 months for inrolment.

Thomas William Booker, of Melin Griffiths Works, near Cardiff, iron-master, for improvements in the manufacture of iron.—Sealed 22nd February—6 months for inrolment.

Jonathan Guy Dashwood, of Ryde, Isle of Wight, plumber, for improvements in pumps.—Sealed 22nd February—6 months for inrolment.

Moses Poole, of Lincoln's-inn, in the county of Middlesex, Gent., for improvements in tanning, dressing, or currying skins,—being a communication.—Sealed 22nd February——6 months for inrolment.

John Dean, of Dover, chemist, for improvements in preparing skins and other animal substances, for obtaining gelatine, size, and glue; and in preparing skins for tanning.—Sealed 23rd February—6 months for inrolment.

Charles Sneath, of Nottingham, lace manufacturer, for certain improvements in machinery for the making or manufacturing of stockings or other kinds of loop work.—Sealed 23rd February—6 months for inrolment.

CELESTIAL PHENOMENA FOR MARCH, 1841.

D.	H.	M.	
1			Clock before the sun, 12m. 37s.
—			☽ rises 9h. 52m. M.
—			☽ passes mer. 6h. 53m. A.
—			☽ sets 2h. 50m. M.
2			Occul 37 Geminorum im. 11h. 14m. em. 12h. 13m.
3	17	10	☿ greatest elong. 18. 8. E.
	21	36	♀ greatest elong. 46. 19. E.
4	4		☽ in Perigee.
5			Clock before the sun, 11m. 45s.
—			☽ rises 3h. 18m. M.
—			☽ passes mer. 10h. 49m. A.
—			☽ sets 5h. 41m. M.
7			Her: in Aphelion.
	1	37	Ecliptic oppo. or ○ full moon
8	21	47	♃ in □ with the ☉
10			Clock before the sun, 10m. 30s.
—			☽ rises 10h. 15m. A.
—			☽ passes mer. 2h. 2m. M.
—			☽ sets 6h. 56m. M.
10	9	36	☿ stationary.
	13	29	Her: in conj. with the ☉
	16		♀ in Perihelion
	19	38	☿ greatest hel. Lat. N.
	21	19	♂ in conj. with the ☽ diff. of dec. 7. 59. N.
11			Occul Solitarii im. 16h. 53m. em. 18h. 8m.
11	5		♂ stationary.
13	17	16	♃'s third satt. will em.
14			Mercury R. A. 0h. 12m. dec. 5. 8. N.
—			Venus R. A. 2h. 24m. dec. 17. 52. N.
—			Mars R. A. 14h. 18m. dec. 11. 16. S.
—			Vesta R. A. 22h. 43m. dec. 12. 9. S.
—			Juno R. A. 12h. 4m. dec. 2. 12. N.
—			Pallas R. A. 21h. 37m. dec. 8. 10. N.
—			Ceres R. A. 23h. 9m. dec. 13. 57. S.
—			Jupiter R. A. 17h. 12m. dec. 22. 19. S.
—			Saturn R. A. 18h. 10m. dec. 22. 23. S.
—			Georg. R. A. 23h. 24m. dec. 4. 25. S.
—			Mercury passes mer. 0h. 43m.
—			Venus passes mer. 2h. 57m.
—			Mars passes mer. 14h. 47m.
—			Jupiter passes mer. 17h. 42m.
—			Saturn passes mer. 18h. 40m.
	4	34	♃ in conj. with the ☽ diff. of dec. 5. 7. N
15			Clock before the sun, 9m. 7s.
—			☽ rises 2h. 52m. M.
—			☽ passes mer. 6h. 13m. M.
—			☽ sets 9h. 33m. M.
	2	19	☽ in □ or last quarter.
	6	33	♄ in conj. with the ☽ diff. of dec. 4. 45. N.
	23	0	☽ in Apogee.
16	17	8	♃'s first satt. will im.
—			Occul h2 Sagittarii, im. 16h. 25m em. 17h. 40m.
19	2	45	Juno in oppo. to the ☉ intens. of light, 0·627.
20			Clock before the sun, 7m. 39s.
—			☽ rises, 5h. 6m. M.
—			☽ passes mer. 10h. 9m. M.
—			☽ sets 3h. 23m. A.
	6	28	☉ enters Aries; Spring commences.
	8	43	☿ in Inf. conj. with the ☉
21	20	40	Her: in conj. with the ☽ diff. of dec. 4. 3. S.
22	7	42	☿ in conj. with the ☽ diff. of dec. 0. 29. S.
23	1	29	♄ in □ with the ☉
	2	36	Ecliptic conj. or ● new moon.
25			Clock before the sun, 6m. 7s.
—			☽ rises 6h. 14m. M.
—			☽ passes mer. 1h. 55m. A.
—			☽ sets 9h. 55m. A.
26			Occul Venus im. 2h. 40m. em. 3h. 23m.
26	3	7	♀ in conj. with the ☽ diff. of dec. 0. 42. S.
27	9	15	Ceres in conj. with Her: diff. of dec. 7. 55. S.
30	2	59	☽ in □ or first quarter.
30	3	16	☿ in conj. with Ceres, diff. of dec. 9. 55. N.
	23		☽ in Perigee.
31	16	21	♃'s second satt. will im.
31			Occul δ Cancri im. 13h. 30m. em. 14h. 22m.

J. LEWTHWAITE, Rotherhithe.

THE

London

JOURNAL AND REPERTORY

OF

Arts, Sciences, and Manufactures.

CONJOINED SERIES.

No. CXI.

Recent Patents.

To Alexander Hett, *of Gower-street, Bedford-square, in the parish of St. Giles in the Fields, and county of Middlesex, surgeon, for certain improvements in the arrangement and construction of fire-grates, or fire-places, applicable to various purposes.*—[Sealed 23rd January, 1840.]

This invention of improvements in the arrangement and construction of fire-grates, or fire-places, consists in a peculiar disposition of the several parts of the fire-place, in order to economise fuel and heat, and raise and maintain the temperature of a room or chamber, at a considerable height or degree of warmth, without employing a very large fire. This object is effected by warming a stratum of air with the heat that would otherwise escape up the chimney without being used,—the air being afterwards, in a warm state, allowed to pass into the room or chamber.

Fig. 1, Plate IV., is a front view of a grate, having false or hollow sides and back, the under part or hearth also being made hollow. A pipe, in communication with the external atmosphere, conveys cold air into the hollow space before mentioned, in the back and sides of the grate; this air being brought into contact with the heated sides and back of the grate, becomes warmed, but not burnt, and in this state is allowed to pass through a conducting pipe, and escape through an aperture into the room; or the warm air may be conveyed through a pipe into a room above, or otherwise nearly contiguous.

Another arrangement is, where the cold air is warmed by the smoke and heat which escapes up the chimney. In this the air is made to traverse a series of bent pipes, extended across the upper part of the grate, and placed in about the same situation as the register plate of a grate of the ordinary construction.

Fig. 2, is a horizontal section of the upper part of the grate, shewing the arrangement of bent pipes, through which the air passes from the external atmosphere into the room or chamber that requires warming. The smoke and heated vapour, in proceeding up from the fire into the chimney, passes between these bent pipes, and thereby raises the temperature of the air contained within them, which is then conveyed from the pipes into the room; or otherwise in the same manner as in the former arrangement.

Fig. 3, is a section, taken transversely, of fig. 1, exhibiting the arrangement of pipes above, and also the hollow back and hearth. In all these figures, similar letters of reference mark the same parts of the fire-place. *a, a, a,* are the front bars of the grate; *b, b,* is the ash-pit; and *c, c,* the hollow hearth; *d,* & *d,** the hollow back, which is divided into two parts by an upright partition *e,*—see fig. 4. A hole *f,* made in the upper part of this partition,

opens a communication between the two parts *d*, & *d*,* of the back.

Cold air is brought from the outside of the house by means of a pipe *g*, and is introduced into the hollow sides and back, at any convenient point, as seen in fig. 1. The cold air rushes into the chamber *d*, formed by the hollow sides and back, and rising up, as it becomes rarified by the heat of the fire, passes through the hole *f*, in the partition, into the other chamber *d**; and from thence, after circulating in this chamber, escapes through the exit pipe *h*, into the room. Or the air, circulating through the hollow side and back of the grate, instead of passing through the hole *f*, into the other chamber *d*,* rises up and proceeds through the bent pipe *i*, (see figs. 2 and 3,) and circulates through the pipes *j*, *j*, *j*, above. Whilst passing through these pipes, as shewn by arrows, the air becomes warmed by the smoke and heated vapour, which ascends between the pipes, as shewn by the arrows in fig. 3, and finally passes down the pipe *k*, into the chamber *d*,* from whence it escapes into the room by the exit pipe *h*, as in the arrangement before described.

The system of pipes *j*, *j*, *j*, is made capable of turning on centres, formed by the bent pipes *i*, and *k*, in order that, when the chimney requires cleaning, they may be thrown back, as shewn by dots in fig. 3, and the throat of the chimney thereby opened. The heat of the room is governed by a mercurial regulator, acting upon a valve, in the ordinary manner.

In fig. 5, these improvements are adapted to a grate for burning anthracite coal. In this arrangement, the system of pipes *j*, *j*, *j*, is dispensed with, and the hollow back, hearth, and sides, only used.

The draft, to support combustion, passes directly through the fire, and back through an oblong hole *m*, made in the

plate of the grate. A pipe *l, l*, which serves as the chimney, is fastened by a flange to the back part of the grate. This pipe passes up through the hollow back, and thereby warms the air contained therein.

The draft through the fire is regulated by a damper *n*, which may, if thought desirable, extinguish the fire. A flat plate *o*, which turns on a hinge *p*, prevents any of the heat, given out by the fire, from ascending up the chimney. This plate may however be thrown back, and the grate used as a common fire-place, with ordinary coal, if required.

Figs. 6 and 7, represent the last described improvement, viz., grates for burning anthracite coal, as applied to a kitchen range. Fig. 6, is a plan view, and fig. 7, a vertical section of a kitchen range, constructed according to my improvements. *q, q*, is the oven, and *r, r*, the boiler for boiling water, situated at the side and back of the fire; *s*, is the lid or cover of the boiler, and *t*, the cock or tap for drawing the water from it. The flue *l, l*, passes through the boiler, and thereby warms the water contained therein.

The patentee states, "It will not be necessary for me to describe this arrangement more minutely, as it so clearly resembles the construction shewn in fig. 5."—[*Inrolled in the Rolls Chapel Office, July 23rd,* 1840.]

Specification drawn by Messrs. Newton and Berry.

To JOHN LEO NICOLAS, *of the parish of Clifton, in the city and county of Bristol, gentleman, for certain improvements in the method of constructing and propelling carriages on railways or common roads, and through fields, for agricultural purposes.*—[Sealed 1st January, 1840.]

THESE improvements, in constructing and propelling carriages, may be divided into three parts or heads.—

The first part of the invention consists of a novel apparatus or arrangement of levers, hereafter described, to be applied or attached to a locomotive engine or carriage, under certain circumstances, by means whereof I am enabled to propel the said engine or carriage in certain situations, where the usual driving wheels would be found partly or wholly ineffectual; such as up very steep acclivities, over newly made roads, or ploughed lands, and through fields, whose surface is uneven and is always slippery in wet weather.

The object of the apparatus is to get a firm hold upon the ground, so that the carriage may be propelled, and that the driving machinery may have a firm fulcrum whereon its force may be exerted, in order to effect such propulsion. The apparatus to be applied to carriages for effecting this object, is shewn at fig. 1, Plate IV. *a, a,* is part of the framing of the carriage; *b,* is a shaft mounted in suitable bearings made in the framing; upon this shaft are mounted any convenient number of circular discs *c, c*; in each of the spaces between these discs, and upon the shaft *b*, are mounted three arms *d, d, d,* which are secured to the shaft *b,* and discs *c, c,* in any convenient manner. A shaft *e, e,* mounted in bearings, attached to the frame-work, carries a number of vibrating levers *f, f*; one end of these levers is weighted, as at *g, g,* for the purpose of raising up the other end when required; and at the reverse end of the levers *f, f,* pendant levers *h, h,* are attached by joints *i, i*; at the lower end of these pendant levers a foot or shoe *j, j,* is attached by a joint; the under side of this shoe is grooved or otherwise roughened, in order that it may have a firm hold upon the ground.

Rotary motion is communicated to the discs *c, c,* and shaft *b,* by means of a toothed wheel *k, k,* which is mounted on the said shaft, and is actuated by suitable gearing in con-

nection with the engine, but not shewn in the drawing. It will be seen, as rotary motion is communicated to the shaft *b*, through the medium of the toothed wheel *k*, *k*, the ends of the arms *d*, *d*, will be brought into contact with the ends of the vibrating levers *f*, *f*, and will thereby depress the pendant levers *h*, *h*, causing them to press against the surface of the ground. As the shaft *b*, continues to revolve, the arm *d*, which has depressed the pendant lever into the position shewn at 2, will escape from contact, and the pendant lever will be brought, by means of the weighted end of the lever *f*, into its original position.

The second part of this invention, used in conjunction with the before described apparatus, is intended to apply only in marshy and boggy situations, where wheels would sink into the soil and could not be propelled.—It consists of a number of boards with raised sides, having their upper surface roughened, for the purpose of giving the feet or shoes of the pendant arms, before described, a good hold, in order that the carriage may be propelled.—These boards, after being used for supporting the pendant levers, are raised from the ground by a peculiarly shaped compound lever, and are carried forwards to the front part of the machine by means of a travelling endless cloth, furnished with hooks, and passed over rollers, one of which is situate at the front part and the other at the back part of the machine. The boards, brought forward in this manner, are to be lowered in front of the carriage, by means of a compound lever, similar to the one employed for raising them from the ground. At the time that the lower ends of the pendant levers are acting against any particular board, the running wheels of the carriage are passing over that board, which is thereby prevented from slipping away.

The third and last part of the invention consists in an improved construction of rotary engine, to be worked by steam, air, gas, or other fluid.

The engine consists of two cylinders, a fixed or outer cylinder, and a smaller cylinder inside the large one; the external surface of the smaller being concentric with the internal surface of the larger, and revolving within it. Fig. 2, is an elevation of the improved engine; fig. 3, is a transverse section; fig. 4, is a sectional plan view, shewing the situation of the smaller cylinder within the larger one. The main shaft *a*, of the engine, passes through the centre of the smaller cylinder, and is attached thereto by means of radial arms. By this arrangement of the cylinders an annular space is formed, which is divided into two parts by steam-stops or sliders. The piston *b*, is fastened on to the external surface of the small cylinder, and revolves with it; *c*, *c*, are moveable steam-stops or sliders which have an alternating action, hereafter described.

Steam is admitted into the annular space through the induction pipe *d*, which conducts it first into two valve-boxes *e*, *f*, which are furnished with valves, worked in any convenient manner, for the purpose of directing the steam to any part of the engine, as is well understood. From the valve-boxes *e*, *f*, the steam passes through two other valve-boxes *g*, *h*, into the steam chambers or boxes *i*, *j*, *k*, *l*, from whence it is conveyed to the engine. Upon steam being admitted into the cylinder, through the steam chambers, it forces round the piston; and as the piston approaches the slider, the said slider is withdrawn, thereby allowing the piston to pass beneath it and uncover the opening, through which the steam escapes into a steam-box. The steam, however, is not allowed to escape, until it has propelled the piston past the place to be occupied by the slider, which is brought down by the waste steam, as will be hereafter described. Steam is then admitted into the annular space, from the steam box *i*, and the piston proceeds in the same manner round to the other slider.

The steam-stops or sliders are actuated in the following manner:—A cam or excentric *m*, mounted on the main shaft of the engine, bears against the shorter ends of two bell-crank levers *n*, and *o*, the longer ends of which levers are connected to upright rods, attached to the steam-stops or sliders *c*, *c*.* Upon the longer radius of the cam being brought into contact with the shorter arm of the bell-crank lever *n*, this lever will be forced outwards, and thereby raise the upright rod and steam-stop or slider *c*,* into the position shewn in fig. 3, and the piston is allowed to pass, as before mentioned. As the piston passes, the waste steam is allowed to rush out of the cylinder, through an opening in the steam-box, from whence it passes through the valve-box *g*, by a pipe *p*, into the upper part of the cylinder of the small reciprocating engine A. The effect of this will be, that the piston in the engine A, will be driven down, carrying with it the end of the lever *q*, which forces down another lever, connected with the slider, and carries it back to its former position. The opposite slider is actuated in a similar manner; but, in order to depress it, there is only one lever, and the steam is let in below the piston of the engine A, by the pipe *r*.

In order to reverse the motion of the engine, it is necessary that the steam be permitted to enter and escape on both sides of each slider. In order to effect this, the valve-boxes *g*, *h*, must be divided into two chambers, by a partition; which should be situated immediately opposite the slider, and each chamber should be furnished with induction and eduction valves, which may be opened and closed by hand. In order that the machinery for withdrawing the sliders, may act with precision, when the motion of the engine is reversed, it will be necessary that the shorter end of the bell-crank lever should be sufficiently broad, so that the cam, which is mounted on the main shaft immediately

above the piston, may act on the said lever before the piston arrives at the slider, either in the forward or backward motion.

The patentee in conclusion, states,—" I do not intend to confine myself to the precise form and portions of any of the parts herein specified, as, under circumstances, the same may be beneficially varied, without departing from the principle of my improvement; but what I claim as my invention is, first,—the method above-described, of constructing the legs, and working them by means of the arms *d, d*, or other similar apparatus, mounted on a shaft and actuated in the manner above described; and secondly,—I claim the method, above described, of constructing, applying, and using moveable railways or platforms, for supporting carriages whilst travelling over bogs or other marshy grounds, such moveable platforms consisting of a number of unconnected boards, which are raised up behind and carried along the side of the carriage, and then let down in front; and thirdly,—I claim the method of working the steam-stops or slides of the rotary engine, above described, and also the reverse motion of the engine, by means of an extra set of valve-boxes, each box being furnished with a double set of valves, which may be instantly brought into or put out of action by hand, as above described."—[*Inrolled in the Rolls Chapel Office, July,* 1840.]

Specification drawn by Messrs. Newton and Berry.

To Thomas Gadd Matthews, *of the city of Bristol, merchant, and* Robert Leonard, *of the same place, merchant, for their invention of certain improvements in machinery or apparatus for sawing, rasping, or dividing woods, or tanners' bark.*—[Sealed 5th May, 1840.]

These improvements in machinery or apparatus for sawing,

rasping, or dividing woods, or tanners' bark, consist in certain arrangements of circular saws, by means of which, wood or bark may be reduced to a finely divided state, for the use of dyers or tanners, in a more economical and expeditious manner than has been effected heretofore.

The peculiar feature of the invention, is, combining or attaching a number of circular saws upon a rotary spindle, in such an arrangement, that although not in immediate contact, they are placed so nearly contiguous to one another, that when any piece of wood, or quantity of bark, is brought under their operation, it will be sawn, rasped, or reduced to a finely divided condition, without leaving any veneer.

By referring to Plate V., it will be seen that fig. 1, is a plan view, and fig. 2, a side elevation of the apparatus. In each of these figures, similar letters of reference indicate corresponding parts.

The circular saws *a, a,* are attached to a spindle *b,* which is mounted in adjustable bearings. The circular saws, or discs of metal, are mounted on their spindle, at an oblique angle thereto, and the space between each saw filled up or occupied by pieces of wood, felt, metal, pasteboard, or other suitable substance. The saws, when properly arranged upon the spindle, are then screwed up between two cheeks, by means of the bolts and nuts *c, c.* As the saws become worn away by frequent use, the bearings which carry the shaft on which they are mounted, must be brought forward a little.—This is effected by means of the adjusting screws *y, y.*

The log of wood is shewn at *d, d,* and is brought under the operation of the rotary saws at *e,* by means of the gearing, shewn in the drawing and hereafter described, assisted by the gravity of the wood itself;—by these means, it is caused to slide or move down the inclined trough *f, f,* as its lower end becomes sawn or rasped away by the action

of the rotary saws. The upper end of the log is kept steady by the pins or spikes *g*, *g*, which are attached to the end of the sliding rack *h*. A counter-balance weight *i*, is attached to the other end of the rack *h*, by a cord or chain *j*, which passes over a pulley *k*.—This weight is intended to facilitate the operation of pulling up the rack, when a fresh log is intended to be placed in the trough *f*, *f*, to be operated upon.

Fast and loose pullies *l*, *l*, are mounted on the driving shaft, and rotary motion is communicated to them from a steam-engine, or other prime mover. On the same shaft are mounted other pullies *m*, *m*, which communicate motion, by means of a strap, to the pullies *n*, *n*, which are mounted on a shaft *o*, above. A bevel friction wheel *p*, is mounted on the shaft *o*, and revolves in contact with the larger bevel friction wheel *q*, which is mounted loosely on the upright shaft *r*; and by means of a common clutch-box *v*, mounted on the upright shaft *r*, immediately below the wheel *q*, the said shaft is made to revolve in its bearings.

A worm or endless screw *s*, is formed on the shaft *r*; as it revolves, it communicates a slow rotary motion to the large worm wheel *t*, on the axle of which a pinion *u*, is mounted; this pinion gears into the sliding rack *h*, and causes it slowly to move down the trough *f*, *f*, and thereby keep the log of wood constantly under the operation of the rotary saws.

When a fresh log of wood is required to be operated upon, the under part of the clutch-box *v*, is lowered, by means of the lever and rod *w*, so as to throw the two parts of the said clutch-box out of gear; then, upon turning the handle *x*, on the axis of the worm wheel, the said wheel and pinion will be turned back; and, by that means, the sliding rack will be brought back again into its original position, as shewn in fig. 2.

The patentees do not confine themselves to the precise arrangement of mechanism herein shewn, as it may be varied, in different ways, without departing from the principle or nature of the invention; but they claim the application of rotary circular saws, to the sawing, rasping, or reducing to powder, of woods or tanners' bark, for the use of dyers or tanners, in whatever manner the said saws may be applied.—[*Inrolled in the Rolls Chapel Office, November*, 1840.]

Specification drawn by Messrs. Newton and Berry.

To DANIEL GOOCH, *of Paddington-green, engineer, for certain improvements in wheels and locomotive engines, to be used on railways.*—[Sealed 28th May, 1840.]

THESE improvements in wheels and locomotive engines, to be used on railways, consist in forming the outer or working surface of the tire of engines and carriage wheels, of steel, which may be made of any required degree of hardness.

The application of steeled tires to wheels, used on railways, has hitherto been prevented, by the difficulty of forging and fixing them. The method employed by the patentee is illustrated by various sectional views, see Plate IV.

Fig. 1, represents a faggot of wrought-iron bars; these are hammered or rolled into a solid piece or bar, and afterwards, in order to form the flanch represented in fig. 2, is drawn through rollers or placed under the hammer on an anvil, having a groove the required shape of the flanch. An indentation is then made longitudinally in the bar, by a swage under the hammer, in order to prepare the bar for welding with the steel;—the indentation thus formed is shewn in section, fig. 3.

Fig. 4, is the section of a faggot of steel bars, piled, so

that when hammered into the wedge form, fig. 5. their edges form the broad surface of the solid steel bar, across the grain of the metal: (the direction of the grain of the metal is shewn in the different views by fine lines across the figures.) The two bars are afterwards heated to a welding heat, and laid together in the position shewed in section, fig. 6,—*a*, denoting the iron bar, and *b*, the steel bar. They are then welded together by the action of hammers or rollers, and afterwards drawn into the form represented in fig. 7, either with a hammer on a grooved anvil, or by rollers. The compound bar is then made into a hoop of the size required,—*a*, fig. 7, forming the inner, and *b*, the outer surface of the tire. The hoop is afterwards bored out and turned to the proper guages, and holes drilled for rivetting it to the wheels.

The wheel, when prepared in the usual manner, by turning the rim, is laid flat on a true face plate, fig. 8, and the tire, having been regularly heated red hot, is put round it. The whole is then plunged into cold water or other frigerific mixture, to contract the tire on the wheel and harden the steel. Holes are afterwards drilled through the rim, corresponding with the holes previously made in the tire, and the parts are rivetted together, or the rivets may with advantage be left out, and the tire put on as shewn in fig. 9.

The patentee states, he does not confine himself to these two methods of fixing the tire, as others might, if necessary, be adopted. Steel, of any kind or quality, may be used in forming the tire; but he prefers the best blister, rolled, shear, or cast steel. Iron unconverted, with its surface across the grain of the metal, may also be used in forming the outer tire, and can be converted wholly or partially into steel, when in the form of a tire, by the usual process of making steel; sufficient thickness and width being left previous to converting, so as to allow of its afterwards being well hammered.

Many important advantages will arise from the use of steeled tires on railway wheels. Besides the economy immediately resulting from their greater durability, a vast reduction will be effected in the wear and tear of the engines, the carriages, and the rails, while a corresponding improvement will arise in the comfort and safety of travelling.

The intense friction to which the wheel is subjected, occasions a rapid wear of the iron tire, productive of most injurious consequences,—an indentation is soon formed by the rail on the tire, which disturbs the action of the wheel, and destroys smoothness of motion. The same cause deranges the action of the engine itself. Every revolution of the locomotive wheel bringing an irregular strain on all the parts, materially increases the wear and tear to which they are liable. Great damage is also done to the railway, on which the wheels, at every revolution, act like so many ponderous hammers.

It has been found advantageous to make the working surface of the wheels conical, diminishing from the flanch; but the conical surface of the iron tire is soon worn down, and the wheel made conical the reverse way, causing a serious loss of tractive power, and increase of friction on all the parts affected. By the use of steel tires, these evils are avoided,—the extreme hardness of the surface enabling them to endure, without injury, the action of the rails, for a considerable length of time.

The patentee claims, firstly,—The modes described of forming and hardening steeled tires of wheels to be used on railways; and,—

Secondly,—The use of steel in the tires of engine and carriage wheels for railways.—[*Inrolled in the Rolls Chapel Office, November 28th,* 1840.]

To James Collard Davies, *of College-place, Camden Town, in the county of Middlesex, jeweller, for an improved clock or time-piece.*—[Sealed 23rd May, 1840.]

This invention consists in the novel application of an additional series of wheel-work to the fourth or last arbor of a train of clock-wheels, whereby the inventor is enabled to construct a clock or time-keeper, that will go for more than twelve months, by being once wound up.

The invention also comprehends placing the second or third wheel, or both the second and third wheels of the said train of clock-wheels, under the dial plate, and before the front plate, or behind the back plate, or, if it is desired, outside the frame; by which combinations and arrangements, the inventor is enabled to construct very small portable clocks or time-pieces, which will only require winding up once in every year. They will have only one spring barrel or actuating power to each department; that is to say, one to the going part, and one to the striking part; whereas those formerly made to go for the same space of time, have always, necessarily from their construction, been large and cumbersome.

The following description will explain the manner in which this invention is to be carried into effect:—

Plate V., fig. 1, is a front view of the interior of the improved time-pieces, made of a size adapted to portability; the dial, and likewise the front plate of the frame, fig. 2, with its mechanism, is removed for the convenience of shewing the parts beneath; fig. 3, is a side view of the clock; *a, a*, the back plate of the time-piece; *b, b, b*, the connecting pillars, by which it is screwed to the front plate *c, c*, shewn more particularly in figs. 2 and 3.

The barrel or box *d*, contains the main-spring, arranged

for six revolutions, and carries on its circumference the great wheel *e*, which is cut with one hundred and forty teeth. The second wheel *f*, has one hundred and ten teeth, with a pinion of ten teeth on its arbor, which is driven by the great wheel *e*, as shewn more clearly in the side view, fig. 3. The third wheel *g*, is of ninety teeth, which, although one of the main wheels of the time-piece, is not placed within the two plates, as has been the custom, but is on the outside of the front plate *c*, *c*, and immediately under the dial of the time-piece; by which means, a considerable saving of room is effected.

In the front plate *c*, *c*, fig. 2, just at the bottom of the circumference of the second wheel *f*, a hole is made, through which is brought the short pinion of ten teeth, forming the arbor of the third wheel *g*;—this arbor and wheel are secured by means of the cock on the front plate, seen in fig. 2, and a corresponding cock underneath the same plate; which last is shewn in fig. 1, but is supposed to be removed in the side view, fig. 3, in order that the connection of the pinion with the previous wheel may be more clearly exhibited. From this view it will be seen that the arbor of the third wheel *g*, is driven by the second wheel *f*.

The works of the time-piece being manufactured and put together as described, the frame *h*, containing a portion of the works, (commencing with what is usually termed the "centre wheel,") is fixed on the front plate *c*, *c*, by its two screws, in such a manner, that the pinion of nine teeth *k*, fig. 3, forming the arbor of the first or centre wheel, comes within the range of, and is driven by, the third wheel *g*. The situation of the other wheels in the frame *h*, need not be particularly described, inasmuch as any ordinary train or series, beginning with the centre wheel, with any escapement whatever, may be made applicable to the purpose, regard being only had to the motive power possessed

by the third wheel *g*; which power being ascertained, as compared with that of the great or fusee wheel of any ordinary watch, the "calliper," or size of the watch-train to be used, must be determined accordingly.

The wheels for the regulation of the relative speed of the hands, technically denominated "the motion," being similar to those in ordinary use for the purpose, need no description beyond what is shewn by the drawing. They are seen immediately under the hands, in fig. 2,—this view being merely given for the purpose of shewing the machine more completely.

The time-piece is regulated for faster or slower movements, by means of the forked arm *l*, figs. 2 and 3; the short arm of which lets out or takes up the balance or pendulum spring, in the ordinary way. The arm itself is moved by a small pin, which slides in a groove, cut in the dial; the other end of the pin being inserted between the fork.

Nothing further need be observed on this head, as it forms no part of the improvements claimed; and other modes of regulation might be used, according to circumstances.

The square *m*, is that employed to wind up the time-piece, the main-spring of which, regulated by its stop-work, should be so arranged, as to cause the great wheel to make six revolutions.

It is also necessary further to state, that in such cases as where it is not of importance that the clocks or time-pieces should be so small as the one just described,—and where they are intended for the mantel-piece or bracket, it may not be necessary to adopt the second part of this invention; that is to say,—placing the second or third wheels of the said clock-train, or both, outside the frame-work; and the clock-train may also bear a different arrangement, and a

great wheel, with a fusee and chain-work, be brought in; in which case, the first part of this invention would be sufficient for the purpose.

The patentee says, lastly,—He claims the application of a train of watch-wheels, beginning at the centre wheel, as aforesaid, to the arbor, acted on by the third wheel of a train of clock-wheels, as aforesaid. The centre wheel of the watch-train being that which is placed upon the said arbor, and the teeth being arranged as aforesaid, whereby the time-piece may be kept going for more than twelve months, with only once winding up.

He also claims placing the second or third wheel of the said clock-train, or both, before the front plate, or behind the back plate, or, at any rate, outside the frame, whereby the size of the said clock, or time-piece, may be greatly diminished.—[*Inrolled in the Rolls Chapel Office, June,* 1840.]

To Thomas Vaux, *of Woodford Bridge, in the parish of Woodford, and county of Essex, land-surveyor, for his invention of a certain mode of constructing and applying a revolving harrow, for agricultural purposes.*—[Sealed 13th June, 1836.]

This invention is a peculiar construction of revolving harrow, so made, that one part of the harrow shall clear the other part as it revolves.

Plate IV., fig. 1, represents the harrow, which consists of two series of arms *a, a,* with bent teeth or spikes, affixed to the naves or bosses of the wheels and picks. These are carried on a framing *b, b,* one end of which hangs on an axis or pivot *c,* at the fore part of the machine.

From the other end of the framing rise two curved racks *d*, which move between guides or standards *e*, at the back of the machine. These standards are affixed to the stationary part of the framing *f*, and descend below for the purpose of receiving the axes of the hind running wheels *g*, and *h*; one of which wheels passes through the ploughed land or furrow, and the other *h*, over the surface of the unploughed land.

The dress-hook *l*, and the fore-wheel *m*, is not in the centre line of the machine, but towards the left-hand; the object of which is to assist in guiding the harrow, and cause it to follow the proper track. And it should be observed, that the pin of the hook *l*, which is connected to the fore-wheel carriage, passes through an adjusting socket, screwed to a transverse bar, which ties the side-framing together. That portion of the draft-hook which passes through the socket being cylindrical, moves in that bar as an axis, and allows the necessary locking-motion, in order to turn the harrow, or to cause it to move in a curved direction.

The depth to which the teeth or spikes of the rotary harrows shall penetrate into the ground, may be regulated by means of two cog-wheels *n*, which, by taking into the racks, raise or lower the framing *b*, of the harrow. These cog-wheels being turned by means of a large wheel *p*, affixed on the same axis, having a number of handles on its circumference, and the racks *d*, are retained in any desired position by means of clicks or catches.

To the framing of the harrow is attached a side-framing, carrying an axis, on which is fastened the wheel *g*, that runs in the furrow produced by the plough,—the harrow being intended to follow the plough; but if the harrow is designed to be used by itself, then the wheel may be dispensed with, and the hook-pin, before mentioned, may be in a direct line with the centre of the machine.

The harrow being drawn forward by horses or men, the

curved spikes or teeth will penetrate the earth and equalize it, (but the patentee has not stated by what means they are made to revolve); and as the teeth on one axis of the rotary harrow are interplaced between the teeth of the other, and as they pass between each other, in addition to pulverizing the earth, they will also clear away any clods, or other obstruction, which they would otherwise carry up, if it were not for the self-clearing process constantly going on. There are also spikes *q*, at the hinder part of the machine, which enter between the spikes of the harrow, and clear it of any material which it might be otherwise incumbered with.

The fore-wheels are provided with scrapers, to keep the surface unclogged, to which they would otherwise be subject by the sticking of the earth; and the hind-wheel, which runs on the ploughed earth, has a spike, supported from a lever; which spike, following in the track of the wheel, opens the earth which has been pressed down by it.

The patentee does not claim any of the parts separately, of which the harrow or its framing are composed, but he claims the mode of constructing revolving harrows, that the teeth or spikes of one part of the harrow, in their revolutions, shall enter between, and clear the teeth or spikes of the other part of the harrow; and he further claims the combination of the other parts, when used in conjunction with the mode of arranging the teeth or spikes of the harrow, as above described.—[*Inrolled in the Inrolment Office, December*, 1836.]

To WILLIAM ARMSTRONG, Jun., *of Hawnes, in the county of Bedford, farmer, for his invention of improvements in ploughs.*—[Sealed 28th August, 1837.]

THE first part of this invention consists of a mode of constructing the share, and part of the frame of the plough,

which enters the socket of the share, whereby greater strength may be obtained.

Plate IV., fig. 2, represents the improved construction of the plough, and the appendages about to be described. The nose *a*, of the plough is formed with a raised projection, cast therein, and a corresponding concave groove is cast in the share *b*, fitted to the nose. By this construction, the share will be considerably strengthened, and the socket less liable to give way than when made of the ordinary form.

The second part of this invention consists of an arrangement of apparatus for regulating the direction of the draft.

The patentee uses a rod *c*, which takes into openings *d*, *d*, in the frame of the plough, higher or lower, as the case or nature of the land requires; or, in place of openings, a rack may be used. This rod is connected to a chain or coupling rod *e*, that passes through the eye of a bar *f*, attached to the plough-beam, and which is capable of being raised or lowered, and retained in any position, by means of a screw. Thus the draft may at all times be kept at, or near, a parallel line with the surface of the land; but, in case the nature of the land is such as to require the bar to be removed, then the coupling chain or links are to be connected to a hook, that passes through the plough-beam, just before the coulter.

The patentee observes, that racks having been before used for regulating the direction of the draft in ploughs, he therefore does not claim the same, unless combined with other parts of the arrangement, above described; but what he does claim, under this part of his invention, is the mode of combining the rod, and coupling links or chain, with the bar *f*, and hook *c*.

The third part of this invention is a mode of affixing the coulter *g*, and consists in the application of cross wedges *h*.

The socket or opening, cast or formed with the frame of the plough, through which the coulter passes, has holes, through which the wedges can be driven across the coulter, for the purpose of causing it to be held securely in the socket, and with greater certainty, than in the ordinary mode of fastening the coulter,—the wedges in other ploughs not passing through the metal socket.

The last part of this invention consists in a mode of securing the share to the frame. The rod *i*, by which the share is fastened, by a bent end or hook, passed through the share, in place of being a mere bolt, inserted into a hole in the stag or bar, which connects the mould-board to the frame of the plough, in this instance passes through a projection, formed on the frame of the plough, and in such a manner, that the rod comes close, or nearly close, to the frame of the plough, and is, consequently, less liable to retain portions of the earth or sod, than when the rod is passed through, and made fast to the bar or stay, as above mentioned.—[*Inrolled in the Inrolment Office, February,* 1838.]

To WILLIAM KEENE, *of Bankside, Southwark, in the county of Surrey, engineer, for certain improvements in machinery or apparatus for sowing corn, grain, and other seed, and manuring land,—being a communication from a foreigner residing abroad.*—[Sealed 2nd November, 1835.]

THIS invention consists of an improved machine for sowing grain, and which, at the same time, is capable of manuring the land.—See Plate IV., fig. 3.

The grain or seed to be sown, is put into a portion of

the upper part of the case *a*, which is divided into two compartments, the other portion containing manure, in powder. In the bottom of the case there is a shifting slide, which may be drawn out or pushed in by a button; and, in the length of this, there are transverse slides, which may be opened or shut at pleasure, to let out or retain the grain in the upper part of the case.

On the transverse slides being opened, the grain falls into cavities, made on the circumference of a cylinder *b*, shewn by dots; which, together with a grooved cylinder, placed in the other portion of the case *a*, for delivering the manure, is made to revolve, either by a crank or any other means producing a rotary motion, and which motion is communicated by the rotation shaft of the running wheels.

At the openings made, by the transverse slides, to permit the grain to fall into the cavities of the cylinder *b*, there are springs, which, at the same time that they prevent more grain entering than will fill the cavities, yield to any stone, pebble, or hard substance, that may get into the cavities with the grain, and permit it to pass, closing down again immediately afterwards by their elasticity, which thus maintains regularity in the quantity of seed carried off by the cylinder in its rotation.

The cavities, in the cylinder *b*, are in series of circles around its circumference, and are of various sizes, appropriate to the grain to be sown; from whence the grain falls through tubes *c*, into hollow socks *d*, and is thereby sown in furrows, at such distances as may be regulated at pleasure, by shutting off the communications from the seed-box, with the socks, or by taking out one or more of the said socks.

The sowing and manuring are effected by the machine being drawn or driven by man, or animal power. The sock cuts or opens the furrow to be sown, and the seed and ma-

nure, carried into the sock by the cylinders, falls down the hollow of the sock into the furrows. Attached to the back of the sock is a rake *e*, joined by a loose hinge to the sock; which rake covers in the seed, which has been sown, with the earth thrown up by the sock in the opening of the furrow.

The depth at which the grain may be sown, is regulated by lowering or raising the socks, by opening furrows of greater or less depth.

The patentee does not claim any of the parts separately; but he claims the combination of the various parts, as above described, whereby the grain and manure, together or separately, are regularly delivered, and sown in the furrows made by the machine, and the seed covered with earth by the rake, attached to the sock, after being sown.—[*Inrolled in the Inrolment Office, May*, 1836.]

To CHARLES HANDFORD, *of High Holborn, tea-dealer, for an improved edible vegetable preparation, called "Eupooi," and the mode of manufacturing the same.*—[Sealed 21st September, 1840.]

THIS material, denominated "Eupooi," is a preparation of chicory root, which is to be cut up or broken into small pieces, about the size of peppercorns, and then roasted in the same way as coffee is usually prepared. After this, it is to be ground, and then boiled in water; the proportion of each being about one pound weight of the chicory to two quarts of water. The material is then to be strained, and so much of the water evaporated as to reduce the liquid to about the consistency of honey, when it is fit for use, and may be added to coffee, in its semi-liquid state, in the pro-

portion of about one-third of the chicory to two-thirds coffee.

The extract of coffee, prepared in this way, will (the patentee states) be found to be perfectly clear; whereas chicory, added to coffee, without such preparation, always produces an extract which is thick or turbid.—[*Inrolled in the Inrolment Office, March*, 1841.]

To WILLIAM TAYLOR, *of Southwick, in the county of Stafford, engineer, and* HENRY DAVIES, *of Stoke Prior, in the county of Worcester, engineer, for their invention of certain improvements in machinery or apparatus for introducing water or other fluids into steam boilers or evaporating vessels; also for obtaining mechanical power by the aid of steam; and for communicating motion to vessels floating in water.*—[Sealed 26th April, 1836.]

THE several features of this invention are embraced under the following general heads:—Apparatus for feeding the boilers of steam-engines with water; a peculiar construction of rotary engine, to be actuated by steam; and certain methods of adapting the said engine to the purposes of propelling vessels and carriages.

The first of these improvements consists in a peculiar construction of cock, for supplying water to a steam boiler; which cock has four ways or passages, and is made self-acting by the intermitting flow of steam or of water into certain vessels through tubes, connected to or forming arms attached to the plug of the cock; by means of which, a reciprocating action is given to the plug, and water is thereby delivered into the boiler, at intervals, in the same

proportionate quantities that the boiler loses its water by evaporation and the discharge of steam.

Plate VI., fig. 1, represents a vertical section of the plug of the cock, and its receiving and discharging pipes and tubes. The plug *a*, is hollow and cylindrical, turning in a socket *b*; and into the plug four tubes lead from two vibrating feeding vessels *c*, and *d*, attached to their ends. Water, from a reservoir, is admitted into the apparatus by a pipe *e*, and is delivered therefrom by the pipe *f*, which conducts it into the boiler.

Supposing the vibrating vessels *c*, and *d*, to be in the position shewn in the figure, steam from a boiler being admitted by the pipe *g*, into the compartment 1, of the plug, it will pass thence along the tubes or passages into the vessel *c*, which will cause an equilibrium of pressure between that vessel and the interior of the boiler, allowing the water to flow out of the vessel and out of the tubes into the compartment 2, of the plug; from whence it will proceed down the pipe *f*, into the boiler. The vessel *d*, at this time being in its elevated situation, and filling with water, supplied from the pipe *e*, through the compartment 3, of the plug, the steam, previously occupying this vessel *d*, will become condensed, and the water fill the vessel and pipes connected to it, leading into the compartment 4, of the plug.

When thus filled with water, the vessel *d*, will be heavier than the vessel *c*, and, by its gravitating preponderance, will descend, and the vessel *c*, rise into the situations shewn by dots, thereby turning the plug of the cock, so as to shut off the steam-pipe *g*, from the compartment 1, and open the communication between the steam-pipe *h*, and the compartment 3.

The steam now passing from the pipe *h*, into the compartment 3, of the plug, will drive the water from that com-

partment, and from the chamber *d*, and tubes, and through the compartment 4, and pipe *f*, into the boiler; whilst the water from the pipe *e*, passing through the compartment 1, will flow into the chamber *c*, which, when full, will again descend and discharge through the pipe *f*. By these means a reciprocating vibratory action of the vessels *c*, and *d*, will be kept up, and a continual supply of water delivered into the boiler, to replenish that which has passed off in steam.

Another method of supplying boilers with water, is shewn at fig. 2, which is a horizontal section; and fig. 3, a vertical section. A chamber *a*, contains a sliding valve *b*, worked by a sliding rod *i*, passed through a stuffing-box and connected to the engine; *c*, and *d*, are two chambers, which, by the sliding of the valve *b*, are brought, alternately, into communication with the water-pipe *e*, leading from the reservoir or cistern placed above. A steam-pipe *f*, leads from the boiler, and a water-pipe *g*, leads to the boiler.

Supposing the parts to be situate as shewn in figs. 2 and 3, the steam, coming from the boiler by the pipe *f*, will occupy the chambers *a*, and *d*, pressing the valve into close contact with its seat or face. The chamber *c*, at this time, is connected, through the passage of the valve, with the water-pipe *e*, and the chamber *d*, with the chamber *a*; but when the valve slides, the passage from the water-pipe *e*, to the chamber *c*, becomes shifted, and a communication is made from the water-pipe *e*, to the chamber *d*. The chamber *c*, and *d*, being thus alternately filled with water, and the communication with the supply-pipe being cut off, after each chamber has been so filled, the water contained in such chamber is then allowed to flow into the larger chamber *a*, and, there being acted upon by the steam from the boiler, through the pipe *f*, so as to produce an equilibrium of pressure, the water then flows down the pipe *g*,

into the bottom of the boiler. Thus, on sliding the valve *b*, to and fro by the agency of the rod *i*, connected to the engine, volumes of water are constantly discharged to the boiler, for the purpose of feeding it.

The peculiar form and improved construction of steam-engine is shewn in figs. 4, 5, and 6. It has been called a rotary engine, but that denomination is not strictly correct, for the piston does not actually revolve, or pass round in a circle, but rolls with an undulating motion within its chamber, which is not a cylinder, but of a hollow circular wedge-form, diminishing toward the centre; the back or outer part of the wedge being a segment of a sphere. The piston is a circular disc, having a slit or opening, which enables it to slide upon a stationary partition within the chamber, forming a steam-stop.

Fig. 4, is a section, taken vertically through the engine; fig. 5, shews the disc or piston detached; and fig. 6, represents the interior of one-half of the chamber, the piston being removed. The disc or piston *a*, has a ball *b*, fixed in its centre, which works in a spherical seat *c*, in the middle of the chamber *d*, *d*, *d*, *d*. The periphery of the disc is tightly packed, and also its slit or opening, so as to be steam-tight against the chamber at its outer surface; and also at the edges which work against the steam-stop; but there are two openings on each side,—one to admit the steam, the other to discharge it. This steam-stop *e*, is a fixed partition, standing across the upper part of the chamber, preventing the disc from revolving, but allowing it to slide with an undulating motion within the wedge-formed chamber *d*, *d*, *d*, *d*. From the ball *b*, a fixed rod *f*, extends at right angles to the disc, but oblique to the axis of the wedge-formed chamber. From the outside of the case or hollow wedge-formed chamber, a horizontal shaft or axle *g*, extends, which turns in stationary bearings; and

from this shaft the driving power, exerted by the working of the steam-engine, is to be communicated by any of the ordinary means for actuating other machinery.

The peculiar manner in which this machine works, it is very difficult to explain by words, or to describe by drawings; it can only be fully understood by a working model. The patentee, however, considers that it "may be illustrated by reference to a terrestrial globe,—the chamber representing that portion or section of the earth situate between the tropics, the sides of which portion or section are hollow cones, the apex being at the centre of the earth, and the bases of the frustrums at the tropics; the equatorial line representing the middle line of the chamber, and the ecliptic or sun's apparent path, the plane of the disc; these two last-mentioned lines continually intersecting each other, at the same angle, as they travel the inner diameter of the chamber, and the outer diameter of the disc being the same."

The operations of the machine may be thus described:—Supposing the parts to be situate as shewn in fig. 4, steam being admitted into the chamber by the pipe *h*, through a narrow slit in the disc, by the side of the steam-stop, it will press internally against the conical side of the chamber *d*, against the steam-stop *e*, and against the face of the disc *a*; and being unable to escape by the steam-tight junctions all round, its elastic force, resisted by the disc, will so act against the steam-stop as to impel the chamber *d*, *d*, in a rotary direction, upon its axle *g*, the disc sliding upon the steam-stop, as they revolve.

In this way the chamber and the disc are carried round together, until the quantity of steam, required to produce half a rotation, has been admitted; when the supply is cut off by the aperture or valve having passed away from the supply-pipe *h*, and the eduction passage *k*, being then

opened, the volume of steam will blow out through the other slit in the disc, and the pipe *k*, and another volume of steam, in the same way, be admitted to continue the rotary action of the engine.

There are several modifications and details of this engine, embodying the same principles of action; but which, from the great number of drawings and elaborate description, we are unable to give; we therefore proceed to the third head of the invention,—the adaptation of this engine to propelling.

Fig. 7, represents a portion of a steam-boat, in elevation, with peculiar kind of paddles, and the mode of applying the improved engine to actuate them. These paddles are arms, intended to move laterally, as oars in the act of sculling.

The rotary shaft of the engine, or a vertical shaft connected to it, is shewn at *a*, upon which there are excentrics or cranks, for driving connecting rods. One of the paddles is shewn at *b*, with its arm extending upwards, and passing through a ball and socket, or universal joint *c*. The crank-rod *d*, as the shaft *a*, revolves, gives a reciprocating movement to the crank *e*, attached to the top of the paddle-arm; by means of which the paddle is made to move to and fro in lateral directions; and an excentric, on the shaft *a*, moves to and fro a rod *f*, which, by acting upon a crank *g*, gives a small rotary movement to the arm of the paddle, by which it is made to turn edgewise whilst performing the returning stroke, as in the act of sculling.

Several modifications of sculling-oars are proposed, and some slight variations in the modes of working them; but, for the reasons above given, we consider the above description sufficient.—[*Inrolled in the Rolls Chapel Office, October*, 1836.]

To WILLIAM ALFRED NOBLE, *of Cross-street, Cherry-gardens, Bermondsey, in the county of Surrey, engineer and pump manufacturer, for his invention of certain improvements in pumps, engines, machines, or apparatus for drawing, raising, forcing, or propelling water or other fluids.*—[Sealed 6th May, 1834.]

THIS invention consists in employing two or more pistons in one cylinder, by means of which the pump is enabled to discharge a much greater quantity of water than pumps in general are capable of raising.

Plate V., fig. 1, represents a pump for raising water. a^1, and a^2, is the lever beam, bearing upon a fulcrum, by which the pump is worked; *b, b,* are the pistons rods; c^1, and c^2, are solid pistons; *e,* is the foot valve in connection with the lower piston c^2; *f,* is the discharging valve belonging to the same; *g,* is the foot valve of the upper piston c^1; *h,* is its delivery valve; *i,* is the rising main; *k,* the cylinder in which the pistons both work; *l,* the cistern to receive the water raised; *m,* a stuffing box through which the rod to the lower piston passes; *n,* is the spout for delivering the water from the cistern.

It will be seen, that on lifting up the lever *a,* the piston c^1, will ascend, and the piston c^2, descend, and thereby create double the space of vacuum in the cylinder with the same motion as could be done by one piston; and consequently raising and discharging double the quantity of water that could be discharged by a pump with a single piston.

A further vacuum is caused, in the loom part of the cylinder, when the piston c^2, is lifted up, the water being admitted through the lower valve *e,* and afterwards forced through the upper box or valve *f,* into the cistern *l,* and discharged out at the spout *n.*

When the piston c^2, descends, the piston c^1, ascends, and the valve *g*, opens, to admit the water or other fluid into the middle of the cylinder; then, on the returning stroke of the pistons, the water is forced through the upper box or valve *h*, into the cistern *l*, and discharged out at the spout *n*.

A further quantity of water might be discharged, by having three pistons in one barrel, as represented in fig 2, *a*, *a*, is the cylinder; *b*, *b*, are two pistons affixed to one rod; *c*, is an intermediate or middle piston; *d*, a close top or flange to the cylinder; and *e*, *e*, delivery pipes.

This modification is merely intended to show, that the patentee does not limit his claim to two pistons; and it may be further observed, that, by adding an air vessel to the discharge pipes *e*, *e*, this, as well as fig. 1, is converted into a fire extinguishing engine, which may be made portable or otherwise, as the exigence of the case may require.—[*Inrolled in the Inrolment Office, November* 1834.]

To ROBERT FINLAYSON, *of Regent-street, Cheltenham, in the county of Gloucester, M.D., for his improvements in harrows.*—[Sealed 21st April, 1838.]

THE subjects of this patent, are improvements upon the iron harrows, so much approved of and extensively used, and for which the patentees obtained letters patent, dated 5th January, 1824, for the specification and drawings of which, see Vol. IX., of the First Series of our London Journal of Arts.

In the present instance, six improvements in harrows are proposed;—the first is in the construction of the frame of the fore wheel, which turns on a pin in its staff, so as to

ensure the wheel running fair behind the nozzle of the harrow when turning; the second is an improved mode of connecting the staff of the fore-wheel with the lever, at the required length, to render the leverage power complete, in raising the tines out of the ground, or allowing them to enter at the required depth; third,—the altered form of the tines rendering them stronger, with the two out-rigger tines added at little additional expence; fourth,—the altered situation and mode of adjusting the hindermost wheels; fifth,—the adaptation of the out-rigger tine to work or remain inoperative at pleasure; sixth,—the application of cast-iron hoes, when required, to the grubber or drill-harrows.—

These are shewn applied to a grubber-harrow, the frame and cross-bars of which are generally made of wrought-iron, but they may be made of cast-iron or wood. The cross-bars support peculiar sort of tines, which are called the *dinotherium giganteum* tines, from its form being taken from the front teeth of that extinct animal; they also support the two out-rigger tines.

These tines are placed before the cross-bars, and pass through them backwards instead of upwards through the cross-bars from below, as usual. From this circumstance, as well as from the curved form of the tines, the vegetable matter they meet with in the progress of the harrow, is pressed upwards and thrown off; thus the harrow is enabled to clear itself of all couch-grass, &c.

The depth, at which the first row of tines work, is adjusted by the regulating lever.—This lever has its short arm attached to the front of the frame, its long arm extending backwards to be within reach of the attendant, behind the upright frame or guide. The lever, a little behind its attachment to the frame, passes through a mortice in the staff of the fore-wheel, on which it acts as its fulcrum; so

that when the handle of the lever is moved downwards, between the upright frame or guide, the frame will be raised, and the tines thrown out of the ground; but, when the lever is raised to the top of the guide, the tines will be working at their greatest depth.

The fore-wheel and its frame, turns upon a pin inserted in its staff, in such a manner, as to ensure the wheel running fair behind the nozzle of the harrow, in turning; and the staff of the fore-wheel is so connected with the lever, as to allow it to be lengthened or shortened, at pleasure, in order to render the leverage power complete. In soft land, two wheels may be used instead of one; in that case, the frame of the fore-wheel works on an axle between the two wheels.

The depth at which the last rows of tines are required to work, is regulated by a revolving handle attached to the axles, and fixed, by a pin going through this handle, to a quadrant-dial plate, fastened at the inside of the wheels. By the simple movement of this handle, upwards or downwards, the undermost wheels are brought nearer to, or removed further from the frame, in order to enable the tines to work at the requisite depth. Beside this mode of adjustment, the hindermost wheels are placed more forward, at the sides of the frame, than in the ordinary harrow, which renders it stiffer,—a great advantage in working strong land.

The out-rigger tines are fixed at the outside of the frame of the shoulder of the harrow, and may be put to work, or remain at rest, according to the stiffness of the soil, &c.

Cast-iron hoes are made to fit the tines of the grubber-harrow, or drill-harrow, in order to cut the weeds under the surface.

The patentee also proposes a horse-hoe, or drill-harrow, which has seven tines,—the front one in the form of a

duck-footed coulter; and when working this harrow between the drills of turnips or potatoes, the cast-iron hoes, above mentioned, may be put on.

All the patentee claims, as new, in this drill harrow, is the cast-iron hoes, and improvement in the form of duck-footed coulters.—[*Inrolled in the Inrolment Office, October*, 1838.]

To Robert Beart, *of Godmanchester, in the county of Huntingdon, miller, for his invention of improvements in apparatus for filtering liquids.*—[Sealed 6th November, 1838.]

The patentee says, that "his improvements relate, in the first instance, to a mode of filtering liquids, by means of a perforated piston, covered with certain filtering materials. The piston, in rising in a cylindrical vessel, produces a partial vacuum below; into which vacuum, the liquor from above descends, passing through the perforated piston and filtering materials; secondly,—the contrivance is particularly applicable to the making of extracts of coffee, for the table; and may also be applied, with advantage, to the obtaining of infusions and decoctions of many chemical matters."

Plate V., fig. 1, represents, in section, the simplest construction of the apparatus, adapted as a coffee pot;—it is of a cylindrical form, and has a perforated piston *a*, placed within it. The piston is connected by two arms *b*, *b*, to a handle *c*, at top, by which it may be raised or depressed. The perforated piston is covered with a closely woven fabric of cotton, woollen, or other material.

A small quantity of boiling water is first put into the

vessel or coffee pot, just sufficient to fill the space below the piston, which is to be slidden to the bottom. The requisite quantity of coffee is then introduced, resting upon the piston, and upon this the boiling water is poured, to make the infusion. The water being allowed to remain for a few minutes, soaking the coffee,—the piston is then drawn up by its handle, when all the liquor will percolate through the piston into the chamber below, which, by the rising of the piston, has been left in a state of exhaustion or partial vacuum.

As the piston must fit tightly into the cylindrical coffee pot, it will be necessary to hold down the vessel, by the feet bearing against the ledge or rim, at bottom, whilst the hand draws the piston up; and which, on being removed from the vessel, leaves the extract of coffee in a very strong, clear, and transparent condition, fit to be poured out into cups, on the table.

A modification of this contrivance, is shewn at fig. 2, in which an iron heater is placed, in a stand, under the coffee pot, for the purpose of keeping the coffee hot, upon the table. In this instance, it is not proposed to withdraw the piston from the cylinder, as above; but, when coffee is to be poured out, the cock *g*, is to be turned, when, by the pressure of the superincumbent air, the liquor will percolate through the filter, and allow it to run out from the cock, at bottom.

The patentee says, in conclusion, "that what he claims, as his invention, is, first,—The mode of filtering liquids, by means of moving pistons, having suitable filtering materials applied thereto; and, secondly,—The mode of applying filtering materials to coffee pots or urns; and wherein it is not necessary, excepting for expedition, to cause the piston and filtering materials to move, to perform the process of filteration".—[*Inrolled in the Inrolment Office, May,* 1839.]

To James Vardy, *of Wolverhampton, in the county of Stafford, gent., and* Moritz Platow, *of Poland-street, Oxford-street, engineer, for improvements in making decoctions of coffee and other matters.*—[Sealed 17th August, 1839.]

The invention consists of a peculiar construction of apparatus for obtaining extracts of coffee, tea, and other infusions and decoctions; in which apparatus, the water, when boiling, is forced out of the vessel by the pressure of steam, generated during the operation, and thence passes into another vessel, having a filtering or straining medium within it. The water, when forced into this vessel, mixes with the coffee, tea, or other matters contained therein; and when the heat, employed for boiling the water, has been removed from the former vessel, a partial vacuum is produced, and the extract is forced back again by atmospheric pressure.

Fig. 1, in Plate VI., represents a section of the apparatus, complete;—it is composed of two vessels, *a*, and *b*. The vessel *a*, is cylindrical, and enclosed in an outer casing *c*, *c*; the vessel *b*, may be a vase, or of any other form, and is generally made of glass; other material will, however, answer the purpose equally well.

To the lower end of the upper vessel *b*, a tube *d*, is attached,—which, when the two vessels are connected, descends into the vessel *a*, as seen. The two vessels *a*, and *b*, are united at the point *e*, by screwing into one another, or they may be connected in any other convenient manner. The filtering medium is placed in the upper vessel *b*, at *f*, and secured in its proper place by a pendant rod *g*, which is screwed into a small bridge, situated at the upper part of the tube *d*. The hollow screw, by which the upper and

lower vessels are connected together, has two vertical grooves or passages formed down its internal surface, for the purpose of allowing the air to escape from the lower vessel to the upper; but the aperture thus made, may be closed, when required, by turning a handle.

Having described the construction of the apparatus, the patentees then proceed to explain the manner of using it. "A quantity of water is poured into the upper vessel, according to the strength or quantity of extract required; then, upon slightly unscrewing the upper vessel, the water will descend into the lower one, where it is made to boil by the spirit lamp *h*.

When the vessels are screwed tightly together, a quantity of tea, ground coffee, or other matter, is to be placed in the upper vessel *b*, upon the perforated plate, or strainer medium *f*. The heat of the lamp will then cause the air, contained in the vessel, to expand, and would force the water, before it becomes warm, into the upper vessel; but, in order to prevent this, the air is allowed to escape through a small aperture, not sufficiently large to allow the steam to pass so fast as it is generated; the consequence of which is, that as steam becomes generated, it will press on the surface of the water, and cause it to ascend up the tube *d*, through the perforated plate *f*, into the upper vessel *b*, where it becomes mixed with the tea, coffee, or other material contained therein. Then, upon removing the lamp, the steam or vapour contained in the lower vessel, will quickly condense, and form a partial vacuum therein; and, consequently, the liquid infusion, contained in the upper vessel, will press downward towards the vacuum, and thereby cause a perfect extract of the matters contained in he upper vessel, to be quickly obtained,—which may be drawn off from the lower vessel by the cock or tap *i*."—[*Inrolled in the Inrolment Office, February*, 1840.]

To Thomas Huckvale, *of Over Norton, in the county of Oxford, farmer, for improvements in ploughs.*—[Sealed 25th February, 1840.]

The first part of this invention consists in constructing ploughs, with double shares, formed in such a manner, that one part of the share acts, at one time, as an ordinary share, and at other times as a coulter.—This is effected by making the share of a peculiar shape, and mounting it on an axis, upon which it may be turned as required.

Fig. 1, in Plate VI., represents a side elevation of a plough, with these improvements applied thereto; fig. 2, is a plan view of the same; and fig. 3, an end view of the double share, detached from the plough. The double share is shewn at *a*, in figs. 1 and 2; one-half of the share is horizontal, while the other half is vertical, acting as a coulter. The share is fixed on, or attached to, the end of a rod *b*, seen by dots, in fig. 1; which rod is mounted in bearings, at the lower ends of the arms *c*, *c*, and is turned therein by means of the handle *d*. When the handle is turned over, the share and mould-board assume the position, shewn by dots in fig. 2. In reference to this part of the invention, the patentee claims constructing ploughs, with double shares and mould-board, and mounting them on axes, as above described.

The next part of the invention relates to constructing a share, which performs, at once, the operation of share and coulter, and dispenses with the ordinary coulter altogether. This share is shewn at fig. 4; the part marked *f*, being intended to act as the share, and the part *g*, as the coulter.

Another of the improvements consists of applying a shoe or foot to ploughs, whereby the heel and mould-board may be raised or lowered, so as to give the necessary dip or

pitch to the plough. The shoe or foot, applied to the heel of the plough, and the mould-board, turns on an axis at one end, and is raised or lowered by means of screws. This part of the invention is but imperfectly explained in the specification.

The next part of the invention relates to a method of levelling lands. A broad share or blade is attached to, and depends from, the axle of a pair of running wheels, and may be depressed by handles, which are held by the ploughman, so as to catch against and gather up earth, or level any clods or lumps that may stand above the surface; such clods or lumps being carried away by the broad share or blade, and deposited in the furrows.

The last of these improvements relates to a paring plough, with two sets of cutters, so constructed, that the three first slices are cut by the first set, and turned over on one another; and they are then again cut by the second and hindermost cutters, and turned over in the opposite direction. When the work is completed, it will be left in ridges, and the sword sides of the slices facing each other.—[*Inrolled in the Inrolment Office, August,* 1840.]

To RICHARD BEARD, *of Egremont-place, New-road, in the county of Middlesex, gent., for improvements in apparatus for taking or obtaining likenesses, and representations of nature, and of drawings, and other objects,—being a communication from a foreigner, residing abroad.*—[Sealed 13th June, 1840.]

THIS invention is a particular mode of applying the principles of photogenic drawing, on the plan of M. Daguerre, commonly denominated Daguerreotype, or, a mode of obtaining the spontaneous re-production of all images; for

which a patent was granted to Mr. Miles Berry, dated 14th August, 1839, (see our Journal, Vol. XVI., p. 1,) under licence from whom, this invention is practised.

The present patentee divides his subjects into three distinct heads; first,—a mode of taking likenesses and representations from nature, and from drawings or figures, by reflecting their images on to suitably prepared surfaces, by a concave reflector, instead of causing the images to be transmitted through lenses, in a camera obscura, as practised by M. Daguerre; secondly,—a new mode of preparing silver plates, or flat surfaces, to receive such images, by pressing the plates face to face between hardened rollers; and thirdly,—an improved mode of treating such prepared plates, by submitting them to the chemical action of iodine and bromine, or bromic acid, combined, instead of treating them with iodine only. By the employment of this combination of iodine and bromine, the surfaces of the silver plates are said to be rendered more sensitive to the action of light, and the operation of obtaining perfect images greatly facilitated, whether performed by reflection from a mirror or through a lense.

In the employment of this reflecting process, the patentee does not intend to confine himself to the use of silver plates, but intends to embrace all other materials that may be capable of receiving the images upon their surfaces.

Plate VI., fig. 2, represents, in section, a slight wooden box *a*, *a*, open at the front, opposite to the person whose portrait is to be taken. In the back part of the box, a concave mirror *b*, is fixed, to receive the image or picture of the person or object set before it. A small frame *c*, is affixed to an adjustable pedestal *d*, which slides in grooves in the bottom of the box, for the purpose of being adjusted to the focal point of the mirror. In this frame *c*, a polished surface is first to be placed, as an experiment, in order to

receive the image, and adjust it correctly, which is done by the operator looking through an opening *e*, in the top of the box.

The focal point being thus correctly ascertained, the experimental plate is removed from the pedestal, and the prepared plate, intended to receive the reflected image, put into the same place. The image of the person or other object, received into the mirror *b*, is now reflected back to the focal point *c*, and there, in the course of about one minute and a half, becomes impressed upon the face of the prepared silver plate, by the electric effect of the reflected light.

The operation being thus performed, the slider *d*, is withdrawn, and the plate removed, (the plate being first carefully shut up in a small box, to exclude it from the light). From hence, the plate is taken into a dark room, and chemically operated upon, as will be further explained, in order to bring out the picture visibly upon the surface, which is effected in a few minutes.

The patentee finds it necessary to modify the light of the sun thrown upon the object, in order that it may not be too intense; and, for this purpose, places blue glass in the sky-light of the room in which he operates, for the purpose of subduing the light; and when the light is not sufficiently powerful, it may be increased by the application of external reflectors, so placed as to illuminate the object.

In preparing plates to receive the images, sheets of copper, silvered, are employed; and the two silvered faces having been carefully cleaned, are put in contact. They are thus, in contact, passed several times between hardened rollers, and afterward annealed at a low red heat; and when cold, rolled again, in a similar manner, until their surfaces become highly polished. These faces may be cleaned with acid, if necessary, to remove any oxydation, when they will be ready for use.

Before applying the plates to the reflector, their faces must be well rubbed by a tuft of clean cotton wool, dipped into diluted nitric acid, and then the acid perfectly cleaned off with tripoli; after which, they should be polished with a velvet rubber and some fine charcoal dust, rubbed lengthwise. The face of the plate must then be subjected to the iodine and bromine, or bromic acid. For this purpose, a square glass vessel is provided, somewhat larger than the plate; this vessel is placed in a box, having only one opening, by which the plate may be slidden into it. The plate is placed, with its face downward, upon a glass slider, having an aperture cut in it nearly of the same size as the plate, and in this way it is slidden over the vessel containing the iodine and bromine, when the vapour, arising therefrom, will attach itself to the face of the silver plate, and in a few minutes it will be ready to be operated upon in the reflecting apparatus. The plates, when thus prepared, may be put into a close dark box, and kept there ready for the operation when wanted.

In combining iodine with diluted nitric acid, equal parts of iodine, of nitric acid, and of water, are to be mixed; and in combining bromine therewith, an equal part is to be mixed with the other three; or, nitric acid may be omitted, and sulphuric acid used instead; or, simply, the iodine may be mixed with the bromine, the vapour of which will quickly operate upon the face of the metal plate.

After the reflected image has been taken, (the face of the plate being carefully excluded from the action of light,) the plate is to be operated upon by mercury, for the purpose of raising and fixing the impression, in the way directed in Berry's patent above alluded to; that is, according to the process described by M. Daguerre.

In taking portraits, it is desirable to place a screen behind the person, in order to receive a shadow, which will

considerbly improve the effect of the picture. These screens may be brown, blue, or black, according to circumstances, which is particularly necessary in taking the images of busts, or statues; and the patentee has found it useful sometimes to place before the mirror a medium of transparent paper, as that will improve the picture, by scattering the light.

The patentee claims, as the particular features of the invention, firstly,—the mode of taking likenesses and representations of nature, and drawings, by reflecting images on to prepared surfaces, by means of concave reflectors; secondly,—preparing the plates with silver surfaces, for receiving the images, by pressing such plates, face to face, between smooth hardened rollers; and thirdly,—the mode of preparing such plates, by combining iodine, nitric acid, and water, or iodine with bromine, or bromic acid, and, by preference, with acid and water, in order that the plates may receive the joint vapour therefrom, for the purpose of quickening the process of obtaining the image.—[*Inrolled in the Inrolment Office, December*, 1840.]

To JOHN COOPE HADDAN, *of Baxing-place, Waterloo-road, in the county of Surrey, civil engineer, for his invention of improvements in machinery or apparatus for propelling vessels and boats by steam or other power.*—[Sealed 22nd January, 1839.]

THE patentee says, that "his improvements apply to that description of propelling machinery which is known as the *screw* propeller, and consists in removing the central parts of the helical thread or propelling surface, for the purpose of allowing the water to escape freely."

Plate V., figs. 1 and 2, represent a side and front view

of the improved propeller, of which little need be said by way of description, as the figures exhibit its form. *a, a,* is the shaft; *b, b, b,* arms extending radially from the shaft, which support metal plates *c, c, c,* bent in helical curves, forming a double-threaded screw; the surfaces of which helical plates, by pressing against the water obliquely as they revolve, impel the vessel forward, and allow the current to pass through the central part without obstruction.

The patentee does not limit his invention to a double-threaded screw, as any other number of coils might suit as well; nor, consequently, to any particular angle of obliquity; neither does he claim any thing which may have been known or used before; but states his invention to be "forming and using of screws with openings or spaces in their threads."—[*Inrolled in the Inrolment Office, July,* 1839.]

Scientific Notices.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from page 56, Vol. XVIII.)

June 16, 1840.

The PRESIDENT in the Chair.

"On the Action of Steam as a Moving Power in the Cornish Single Pump Engine."

By Josiah Parkes, M. Inst. C. E.

In this communication, the author presents a detailed analysis of some of the facts collected and recorded by him in his former communications, with the special object of ascertaining from the known consumption of water as steam, the whole quantity of action developed—the quantity of action had it been used un-

expansively—the value of expansion—the correspondence between the power, and the resistance overcome—and, finally, a theory of the steam's action, with a view of determining the real causes of the economy of the Cornish single pumping engine.

The data employed for the purposes of this investigation, are those obtained from the Huel Towan engine by Mr. Henwood, from the Holmbush by Mr. Wicksteed, and from the Fowey Consols, and recorded in the author's communications in the Transactions of the Institution of Civil Engineers, Vols. 2 and 3.

Steam may be applied in one or other of the two following modes: expansively, that is, when admitted into the cylinder at a pressure greater than the resistance, and quitting it at a pressure less than the resistance; or unexpansively, that is, when its pressure on the piston is equal to the resistance throughout the stroke. By the term *economy* in the use of steam, is meant the increase in quantity of action, obtained by the adoption of that mode which produces the greatest effect.

The weight of pump-rods, &c., which effects the pumping or return stroke in a Cornish engine, is greater than the weight of the column of water, by the amounts necessary to overcome the friction of the water in the pipes—to displace the water at the velocity of the stroke—to overcome the friction of the pitwork, and of the engine itself. The absolute resistance opposed to the steam, consists of the weight which performs the return stroke, plus the friction of the engine and pitwork, and the elasticity of the uncondensed steam.

The water-load in the Huel Towan engine was very accurately ascertained as 11 lbs. per square inch on the piston; and it is shown that the additional resistance amounted to 7 lbs. in the Huel Towan, and to 6 lbs. in the other engines, so that the whole resistance in the Huel Towan engine is 18 lbs. per square inch of the piston. Now, the elastic force of the steam at the termination of the stroke, and before the equilibrium valve is opened (ascertained from the ratio of the volumes of steam and water consumed), is only 7 lbs. per square inch, that is, 4 lbs. less

than the water-load alone. The corresponding results for the other two engines are equally remarkable, and show most distinctly that, at the termination of the stroke, the pressure of the steam is far below the water-load, as had been previously observed by Mr. Henwood and others.

The next step in the analysis is to determine the portion of the stroke performed, when the pressure of the steam in the cylinder is just below the resistance, and then to separate and estimate the spaces through which the piston is driven respectively by steam, of a pressure not less than the resistance, and less than the resistance. These facts being ascertained, the virtual or useful expansion, and the dynamic efficiency of the steam, during the two portions of the stroke, are known; and it appears that there is a deficiency of power, as compared with the resistance overcome, of above 3 lbs. in the Huel Towan, and more than 4 lbs. in the other engines, per square inch on the piston.

From these startling facts, and a careful examination of Mr. Henwood's indicator diagrams, the author was induced to inquire whether the piston had not been impelled by force altogether distinct from the continuous action of the steam upon it, namely, by a force which is to be referred to the sudden impact on the piston when the admission valve is so fully and instantaneously opened, as it is in these engines, and a free communication established between the cylinder and the boiler. To this instantaneous action on the piston, the author, for the sake of distinction, assigns the term *percussion;* and, proceeding to analyse the authentic facts under this view, it appears that the space of the cylinder, through which the piston was carried by virtue of this percussive action, was about 21 inches in the Huel Towan, 27 inches in the Holmbush, and 33 inches in the Fowey Consols engines.

The results thus unfolded, which are facts independent of any hypothesis, appear less startling on a full consideration of the circumstances under which the steam is admitted into the cylinder. The engine has completed a stroke, and is brought to rest by the cushion of steam between the piston and the

cylinder cover; a vacuum is formed on the other side of the piston; the elastic force of the steam in the cushion then nearly balances the resistance. A communication is now suddenly opened between the cylinder and the boiler containing steam of a high elasticity; and the piston, being ready to move with a slight increase pressure, receives a violent impulse from the steam's instantaneous action. The piston having started, the influx of the steam is more or less retarded by the throttle valve, and its elastic force, though at first greater than the resistance, is soon reduced considerably below it, the mass of matter in motion acting the part of a fly wheel, absorbing the excess of the initial power over the resistance, and discharging it by degrees until the stroke is completed.

The indicator diagrams, which are the transcripts of the piston's movements, show that such may be the nature of the action on the piston, and the discussion of numerous well-established facts and phenomena, for the Cornish engines, strongly confirms this view of the case. Whatever may be the theory of the steam's action, the fact that the sum of those actions has carried the piston through its course, is certain; and it seems equally certain that the quantity of water as steam which enters the cylinders, was insufficient alone to overcome the resistance.

The author then investigates the amount of useful action due to the steam, imprisoned between the piston and the cylinder cover, and recovered each stroke, which, for its use in bringing the engine to a state of rest at the end of the return stroke, he terms the *cushion*. This quantity, though small, is appreciable, and its value is assigned for each engine.

The author treats lastly of the evidence furnished by the diagrams of the indicator, and of its utility as a pressure gauge. The communication is accompanied by elaborate tables of the results of the analysis, and an appendix with the calculations worked out in detail.

Mr. Wicksteed, being called upon by the President, declined at present giving an opinion upon the theory before the meeting.

He stated, that he was still trying experiments upon the engine at Old Ford—that the results up to the present time were in accordance with his anticipations—that, with small screenings of Newcastle coals, the duty of the engine amounted generally to 75 millions, and sometimes to as much as 81 or 82 millions. He thought that 7 lbs. per square inch for friction and imperfect vacuum was too large an allowance for an engine of the size of that at Old Ford, as, when the speed was 10 to 11 strokes per minute, the power was equal to 200 horses, and, if an allowance of 6 or 7 lbs. was made, it would be equal to 100 horses' extra power, which he felt certain could not be correct. At the same time he believed, that in very small engines the amount of friction, &c., might be correctly estimated at 6 or 7 lbs. per square inch. He had also tried some experiments upon a Boulton and Watt low-pressure engine: by the introduction of Harvey and West's patent pump valves, the duty of the engine had been increased from about 28½ to 32½ millions. He was now trying experiments on clothing the cylinder, &c., and with steam in and out of the jacket: the result of all these experiments should be laid before the Institution as soon as they were completed.

Mr. Seaward considered the paper to be very valuable, as opening a new view of the action of steam, and inducing discussion and experiment; but he was not prepared to allow at once the percussive action, nor could he admit it to be the cause of the increased duty; as, if so, an augmentation of pressure in the boiler would give a corresponding increase of duty. Engines were worked at all pressures up to 60 lbs., and even higher; but it was not perceived that the highest pressure gave the best results. He attributed the increase of duty to an improvement in the manner of using coal under the boilers; to the use of good non-conducting substances for clothing the cylinders, steam-pipes, &c., to prevent the radiation of heat; and to the general improvement in the construction of the valves and other parts of the engines, the proper dimensions for which were at present better defined. The expansive principle did not seem to have operated so well in the rotary as in the pumping engines. He had not

hitherto credited the statements of engines working with a consumption of coal of 5 lbs. per horse power per hour, nor of the great advantage of the use of steam at high pressures. Several Scotch boats had been worked with steam, at a pressure of 33 lbs. on the inch, without any corresponding advantage. The increase of duty, then, he attributed to other reasons than the effects of percussion, as, independent of other considerations, the steam must always have possessed the same percussive force, which it must have exercised without producing the effects now attributed to it.

Mr. Wicksteed observed, that there were many reasons why the duty of the double expansive engines in Cornwall was not in proportion to that of the single pumping engines. The introduction of the former, only dated from about the year 1834; but few had been made; there had not been the same amount of experience to guide the engineer in their construction; they were of small size, and consequently the amount of the friction was greater in proportion than in the large single pumping engines. Notwithstanding all these disadvantages, the duty had increased from 15 or 20 millions to 57 millions. It had been stated, that the double expansive engines, constructed by Hall and by Penn, did not consume more than 5 lbs. of coal per horse power per hour; while the ordinary low-pressure double engines required from 8 lbs. to 10 lbs. of coals. He would suggest to such members as possessed the power of verifying this fact, to communicate their observations to the Institution.

Mr. Rendel would direct the attention of members to the main feature of Mr. Parkes's paper, which was the discovery of the action of a percussive force by the steam. The full investigation of this subject deeply interested the scientific world; and it was important that its merit should be clearly displayed. If any power could be gained from the percussive action, the more suddenly the steam could be admitted upon the piston, the more advantageous would be the result. It would be interesting to learn whether, in the changes in Cornish engines, from which such improved duty had resulted, any increased area had been given to

the steam pipes and valves, and to what extent as compared with the old practice. If any change of this kind should be found to have taken place, it would be an argument in favour of the percussive principle.

Mr. Field expressed his sense of the obligations which the Institution owed to Mr. Parkes for having taken up this subject. It had been supposed by many persons that, independently of the economy arising from clothing the cylinder, jacket, and boilers, and the expansive action of the steam, some other cause might have assisted in producing the increase of effect in the Cornish engine. Doubtless, much had been done to economise heat and steam by the slow combustion of the fuel under the boilers, by diminishing radiation, and by expansive action. Nevertheless, the question to be solved was,—Can these improvements account for the whole progressive advance in the duty from 40 or 50 to 90 millions? He trusted that Mr. Wicksteed would apply the indicator to his engine, and ascertain the pressure on the piston at every portion of the stroke.

Mr. Parkes remarked, that many observing men had conceived doubts of the sufficiency of the commonly-conceived theory of expansion to explain the excessive economy of the Cornish above the unexpansive engine. Some had recorded this opinion. Mr. Henwood found the steam's force in the Huel Towan engine unable to sustain the water-load alone. Messrs. Lean showed a similar deficiency of steam power in an engine at the United Mines; and Mr. G. H. Palmer was perfectly correct in his statement, that the absolute force of steam, as commonly appreciated, was inadequate to the performances assigned to it; but he was wrong in asserting that these effects had not been obtained, for they were indubitable.

As doubts had been expressed with regard to the accuracy and sufficient duration of the experiments selected as the basis of his analysis, he would state, that Mr. Henwood obtained the quantity of water consumed as steam, during a continuous observation of 24 hours, having previously measured the water discharged by a given number of strokes of the feed pump, and

then counting the entire number of strokes made to supply the boilers during the experiment. The pump was used periodically, and its whole contents injected into the boilers at each stroke, so that no material error could arise as to the quantity of water consumed as steam. With respect to the resistance overcome, Mr. Henwood several times measured the whole height of the lifts in the most careful manner, not comprehending the fact of the steam's force being unequal to sustain the load of water alone. Not content with this, he measured the water discharged by the pumps, and found a near correspondence with the calculated quantity.

Mr. Parkes would prefer a short experiment on the consumption of water as steam to a long one, as more likely to be accurate. He had rejected the eight months' experiment on the United Mines engine, as being unsuitable for the purpose of his investigation; for, during so long a period, the boilers must have been several times emptied and cleaned, stoppages must have occurred, condensation, leakage, and other circumstances must also have taken place, which unfitted that experiment for analysis. Long experiments were the best for the practical determination of the duty done by coal; but the action of steam, in performing that duty, was altogether a separate consideration. The consumption of water as steam for a single stroke of the engine, if it could be obtained, would be all-sufficient for investigating its action in the cylinder, as the weight raised by a Cornish engine must be the same at every stroke. If any error existed in the statement of the water evaporated, it was more likely to be in excess than in deficiency; for it would be admitted that the conversion of 10½ lbs. of water into steam, by 1 lb. of coal, was not a common occurrence. Yet, granting this result to have been obtained, it appeared that there was not steam enough to overcome the resistance. Such was the result of the analysis of the Huel Towan and Fowey Consols engines, for which the evaporation was ascertained; and if less water had been converted into steam, the deficiency of power, compared with the effect, would necessarily have been still greater. Mr. Henwood's statement of the per-

formance of the Huel Towan engine, was confirmed by a previous trial of the same engine in 1828, conducted by a committee of twenty-one competent persons; when it appeared, after twenty-six hours' experiments, that 87,209,662 lbs. had been raised one foot by a bushel of coals. Mr. Henwood's experiment gave 81,389,900 lbs., so that in the analysis the lowest result was used.

It had been urged, that if any such force as percussion belonged to steam now, it always formed one of its properties. This was true; but it either may not have been well applied, or its effect not detected. The expenditure of power, as derived from the quantity of water consumed as steam, conld not be determined so long as any condensation of steam took place in the cylinder; for whatever steam was there condensed, had lost its power. The perfect clothing of the Cornish cylinders rendered the analysis of the action derived from a given quantity of water as steam, nearly free from error.

Mr. Wicksteed had stated, that when he kept the steam out of the jacket of one of Boulton and Watt's engines, it required full steam throughout the stroke to overcome the load; whereas, with steam in the jacket, some expansion could be used. This would show a greater expenditure of power in one case to produce an equal effect. Such, however, could not be: an equal power operated in both cases; but in the one, a portion of it was annihilated, or had produced no useful effect.

Mr. Parkes considered it as demonstrated, that a force, independent of the steam's simple elastic force within the cylinder, did operate in the Cornish engines. The term *percussion* might be objected to when applied to an elastic fluid. Nevertheless, he conceived that the instantaneous action transmitted to the piston, on the sudden and free communication effected between the cylinder and boiler, must produce an effect analogous to the percussion of solids. He considered the proofs of such action, adduced in his paper, as irresistible.

He would ask how it could be accounted for that the steam was in a state of expansion during 19 out of 20 parts of the stroke in the Huel Towan engine, as shewn by the indicator diagram,

though it was freely admitted during one-fifth of the stroke, unless a velocity had been given to the piston by an initial force exceeding that of the steam's simple elastic force? How was it that, at the end of the stroke, the steam's elasticity was able to sustain so small a portion of the load in equilibrio, unless a momentum had been transferred to the mass by the impact on the piston, and aided the expanding steam to complete the stroke, which alone it was incompetent to perform? The greater degree of attenuation in which the steam was found on the completion of the stroke in one engine than in another, compared with the pressure of the resistance, and with the amount of expansion determined by the period of closing the valve, alone proved that the ordinary theory was inadequate to explain the action of steam in these engines.

He had for some time conjectured that a hidden and unsuspected cause influenced the performance of the Cornish engine; and if he had hot been successful in discovering its nature, he considered the analysis as placing the fact beyond question, that the quantity of action resulting from the steam admitted into the cylinder, was much below the force of the resistance opposed to it, and overcome.

Original Communication.

ON THE ENGINEERING OF THE ANCIENT EGYPTIANS.

BY J. S. PERRING, ESQ.

Amongst ancient nations, the Egyptians were celebrated for science and the mighty works they constructed; and, therefore, an enquiry into their engineering knowledge and constructive and mechanical talents, becomes extremely interesting.

We now propose, in a series of papers, to elucidate these subjects, examine the testimony of historians, and see how far the

remains of works, still existing, verify their records; and, in so doing, shall have to adduce instances of scientific construction, and relate operations of which modern science might justly be proud.

It is not part of our plan to enter into examination of the style or peculiarities of their architecture, though we have to investigate the principles of design, as shewn in their buildings,—the mighty and everlasting monuments which still remain to shew their practical talent as constructors. Though this will seem to encroach on the field of the sister profession of architecture, yet we make use of the term Engineering, as embracing more peculiarly the science of construction and of statics, as exemplified in practice.

The fertility of the valley of the Nile being derived solely from the annual inundations of that mighty stream, the prosperity of the whole country demanded that the stability and management of the works, controlling and regulating the waters, should be entrusted to careful and vigilant supervision; hence must have arisen the establishment of a class of officers, whose fitness for the duties confided to their care, was a knowledge of hydraulic engineering.

Of the high rank held by those entrusted with the execution of public works, we have ample proof from the tombs; and the fact shews the esteem in which the profession of civil engineering was held, and the honorable rewards that were bestowed upon the exercise of talent on a science to which Egypt, from its peculiar features, owed so much.

Mr. Birch,* in his learned lecture upon Hieroglyphics, delivered at the Rōyal Institution, mentioned a high functionary, whose tomb still remains at Beni Hassan, where the texts narrate in his praise—" he has set up Stelæ in the South, he has worked in the North; and, like Heaven, he has guided the great River in its plain." Again it declares—" that he has set up tablets in his southern frontier, to the region of Ouri; in his northern, to the abode of the Jackal, (probably Lycopolis); that he has extended the great River in its course, and its waters in the marshes." Mention occurs of his labours in the " fields of the fallen," or a conquered country; and the text gives dimensions of some buildings which he had erected.

The tomb of a distinguished individual, who held the important post of superintendant of the royal palaces, during the reigns of Suphis, the builder of the Great Pyramid of Ghizeh, and his father and predecessor, occurs a little to the westward of the Pyramid, and in it are some very interesting sculptures relating to the trades, in which workmen of most of the handicrafts employed

* To the kindness of this gentleman we are indebted for much valuable information.

in building are exercising their vocation.—These sculptures are near 4000 years old, and shew an advanced state of society, familiar with the arts and sciences; indeed, it is difficult to assign a probable period when the Egyptians emerged into civilization.

Mr. Birch mentions another functionary of the age of Cephrenes, the successor of Suphis; and the next in antiquity and importance, is the one above mentioned, whose tomb is at Beni Hassan,—he lived about the time that Joseph was in Egypt. There is a tomb in the possession of Signore Athanasi, Lot 477, which has been executed for an officer "attached to the charge of the house, chief of the constructions of the King," and from the style of sculpture, has apparently been executed about the same period.

In the British Museum, No. 164, is a tablet of a superintendant, charged with the reparation of temples, under the reign of Rameses the Great; and near the second Pyramid of Ghizeh, is another person, entitled Overseer of the Workmen of the same King; and another holding the same situation in the palace of Thothmus V., in the centre of Abydos. Another functionary, about the time of King Horus, is mentioned as having charge of the excavation of the quarries, and indirectly mentioned as having "filled the heart of the King with his constructions." The quarries of Tourah and Maasara seem to have been under the charge of officers of the highest rank, some of them being architects, &c.; and an inscription on the Cosseir Road, about the period of Amasis, has been recorded by a "Chief of the Constructions of Upper and Lower Egypt."

But the earliest transactions, spoken of by historians, relate to the labours which converted the whole of the morass or marsh of the Delta, as it existed in a natural state, into smiling and fertile fields, and rendered it fit for the habitation of man.

Herodotus, Bk. II., S. 4.—"The name of the first King was Menes, (B. C. 2320) in whose reign the whole of Egypt, below the province of Thebes, was one extended marsh;" and again, Sec. 99.—"Menes, the first sovereign of Egypt, effectually detached the ground, on which Memphis stands, from the water. Before his time the river flowed entirely along the sandy mountain, on the side of Africa. But this prince, by constructing a *bank* at the distance of a hundred stadia from Memphis, towards the south, diverted the course of the Nile, and led it, by means of a *new canal*, through the centre of the mountains;" that is, at equal distance between them, but still along the same valley, and not as some authors have supposed, by cutting through the mountains; but to resume the narrative,—"And, even at the present period, under the dominion of the Persians, this artificial channel is annually repaired, and regularly defended. If the river were here once to break its banks, the town of Memphis

would be inevitably ruined. It was the same Menes who, upon the solid ground thus rescued from the water, first built the town now known by the name of Memphis, which is situated in the narrowest part of Egypt. To the north and west of Memphis he also sunk a lake, communicating with the river, which, from the situation of the Nile, it was not possible to effect toward the east."

From this interesting and instructive passage we learn, that at a very early period, in the infancy of the Egyptian monarchy, their hydraulic engineers had the boldness to attempt, and the skill to successfully accomplish, the stupendous undertaking of diverting the course of a broad and rapid river, a labour to which the annals of modern engineering offer no parallel; and whose great and many practical difficulties can only be appreciated by those who are acquainted with the nature of the country.

So formidable and so improbable has appeared this enterprise, that many commentators have considered the narrative as typical of some great change effected in the constitution of the country, but the literal truth of the account has been pointed out by Sir Gardner Wilkinson,* as "strongly corroborated by the actual appearance of the Nile, near the spot where, according to Herodotus, the river was dyked off, which he fixes at *about* a hundred stades above Memphis. Near Kafr el Iyat, fourteen miles above Metrahenni, it takes a considerable curve to the eastward; and would, if the previous direction of its course continued, run immediately below the Libyan mountain to Sakkara."

To this testimony we may add that derived from our personal and careful examination of the spot; and though the gradual elevation of the whole country, by the deposit of the rich soil of the Nile, has concealed the dyke, yet the track of the ancient bed of the river may still be traced by the low ground, extending from Kafr el Iyat to where it joins the Bahr Joussuffee, a little to the north of Bernasht. The Bahr Joussuffee, or River of Joseph, is an artificial canal, branching out from the Nile, near Hermopolis, and forms the trunk which supplies the smaller canals with water for inundation and irrigation. To the south of Bernasht, it is evidently formed by excavation, but to the northward thereof, it loses its artificial appearance, and flows past the ancient site of Memphis, near the Libyan mountain, occupying the broad and shallow channel of the old bed of the river.

It may be here mentioned, that the ignorant inhabitants of the country ascribe the formation of the Bahr Joussuffee to Joseph, the son of Jacob; and this evidently points to a tradition of its

---

* Vide his "Egypt and Thebes," P. 341; and also his Manners and Customs of the Ancient Egyptians, Vol. I.

great antiquity, though the actual name may have arisen from its having been repaired by the Sultan Joussuf Salah é Deen, commonly called by our writers Saladin. It is also called El Menhee and El Bainhee, the former of which names evidently refers to the Menes* of Herodotus.

That part of the ancient bed of the river, north of Memphis, appears to have been used as a canal during the time of Herodotus; and vessels coming from Naucratis to Memphis, sailed, during the inundation, along the side of the Libyan mountain, and thus avoided the rapid stream of the river.

Political and religious motives may alike have dictated to Menes the eligibility of diverting the course of the river;—political, for, by placing the Nile between his new capital and the only vulnerable side of Egypt, it formed a barrier of safety against the sudden irruptions of the Nomade tribes of central Asia, who, from the earliest period, seem to have "breathed the living cloud of war," wherever hope of plunder might lead them; and their fierce and occasional irruptions could only be bounded by natural obstacles.

The peculiar tenets of the Egyptians seem to have led them to associate more with the eternal dead than the living; and as the locality for the new city seems to have been pointed out by its situation as commanding both Upper and Lower Egypt, it may have been considered necessary to divert the course of the Nile, in order to connect the city with the western mountain, called emphatically in the inscriptions, "the region of the Amenti and abode of the Dead," behind which the bright orb of day sank each night to rest.

We are informed that the inundation was under the care of proper officers, whose duty related to the distribution of the water throughout the whole country, and its withdrawal at the proper period; and the system established by the ancients has probably continued unto the present day, but followed with less vigilance and attention; and the consequence is, that we have often seen some parts of the country over-inundated, whilst others have not had the proper supply; and, during the year of a low Nile, from proper care not having been taken to husband the water, famine has been the result. The difference between ancient and modern supervision, is shewn by the fact, that with a population of seven millions, Ancient Egypt exported grain in large quantities, whilst Modern Egypt, with scarce two millions, is occasionally obliged to import corn from Europe; and the cotton and other articles, intoduced by the present Pacha, cannot be considered an equivalent.

---

* In the Hieroglyphics Menie.

But we are wandering from our subject.—The whole country is divided into separate portions or levels, by dykes or embankments, which, at various places, are pierced with sluices, the opening and shutting of which regulates the quantity of water in each district. The water being supplied principally by taking it higher up the Nile, is generally somewhat above the level of the river adjoining, into which, should there be an excess, it is run off. It often happens, that individual interest and the public weal are at variance with regard to the quantity of water and the time of its admission and withdrawal; but for an individual to have interfered with this, appears, amongst the Ancient Egyptians, to have been held a sin of no small importance, as in the usual negative confession of the Ritual, one of the sins that the deceased denies to have committed is, "to have pierced the water in its increase, or to have partitioned an arm (or canal) from its course."

In our next, we propose giving an account of their engineering works in the Fyoom, and the mode with which that fertile district was supplied with water; and the following will treat of their skill, as displayed in those wonders of the ancient world,—the everlasting Pyramids.

Scientific Adjudication.

BEFORE THE PRIVY COUNCIL.

On the petition of John Woodcroft, of Manchester, for the extension of the term of a Patent Right, granted 31st March, 1827, to Bennett Woodcroft, "for his invention of certain processes and apparatus for printing and preparing for manufacture, yarns of linen, cotton, silk, woollen, and other fabrics." (See vol. I., page 32, of the Second Series of the London Journal of Arts, &c.)

The judicial committee of the privy council met on the 11th of February, to hear and decide upon the petition for an extension of this patent. The judges present were Lord Brougham, Mr. Justice Bosanquet, Mr. Justice Erskine, and Dr. Lushington.

Sir W. Follett and Mr. Teed appeared for the petitioner; Mr. Hill and Mr. E. F. Moore on behalf of Messrs. Delaunay, in opposition to the petition; and the Attorney-General appeared on behalf of the crown.

Solicitors for the petitioner, Messrs. Kay, Barlow, and Aston; solicitor for the opposers, Mr. Harrison Blair. Agents for the opposers, Messrs. Newton and Berry, Chancery-lane, London.

Mr. Teed opened the case, the usual proof of the patent having been granted, and the necessary advertisements in the public prints given. It appeared that caveats had been entered by Messrs. Delaunay, Messrs. Stone and Kemp, and Mr. Lewis Schwabe.

At the suggestion of Mr. Hill, an assignment was put in and read between Bennett Woodcroft of the one part, and John Woodcroft of the other part, reciting several letters patent, and reciting the dissolution of the partnership by the parties in 1835, but that no settlement of the accounts had been made between the parties, and that a bill had been filed in chancery; that to terminate the suit and settle the disputes between the parties, they had been referred to arbitration; that an award had been made which was recited, viz., that £800 should be paid by John to Bennett Woodcroft; and that on payment of that sum Bennett Woodcroft should assign his interest in the letters patent to John Woodcroft; that Bennett Woodcroft had previously granted licenses to certain persons named to use the invention; and that it was agreed that in consideration of the £800. the payment of which was acknowledged, Bennett Woodcroft should assign his interest in the patent in question to John Woodcroft.

Mr. Teed stated that by an agreement made on the 18th of September, it was agreed, in case of an extension of the patents, Bennett Woodcroft should be interested in one-third, and John Woodcroft in two-thirds.

Joseph Brotherton, Esq., M.P., sworn.—Mr. Hill: Are you interested in this patent?—Not in the slightest degree.

You are not a partner with either of these gentlemen?—Not at all.

Examined by Mr. Teed: You are acquainted with the Messrs. Woodcroft?—I am.

Have you been long acquainted with them?—About five and twenty years.

Mr. John Woodcroft and Mr. Bennett Woodcroft?—Yes.

Do you know of Mr. Bennett Woodcroft being engaged in the printing of yarns?—Yes.

Do you know whether he was engaged for any considerable time in that?—I think he was, but I cannot precisely state the time.

Do you know whether his health was affected by his application to it?—I think he was very assiduous in his attention to the invention.

You knew him when the patent was obtained?—Yes, in March, 1827.

Have you any knowledge of the expense which was incurred in obtaining the patent?—I always understood—

Lord Brougham: You must tell us what you know yourself.—I could only know from the statement of the partners that it was about one thousand two hundred pounds.

Mr. Teed: Have you been engaged in the examination of their accounts for any purpose?—I have frequently seen their accounts.

Do you know from the result of the examination of the accounts, what it was?

Mr. Hill objected to the question.

The council were informed that the state of the accounts must be proved by the person who kept them.

Mr. Teed: Do you know of Mr. Woodcroft taking any premises for the purpose of applying this patent?—Yes, they took some premises of the late Mr. Berry, a gentleman whose executor I am.

When was that?—I think it was about the year 1830, but I am not quite certain as to the dates.

Do you know what they were?—It was a factory.

Is there more than one factory?—There was one principal factory, and probably there might be an additional building, but not to any great extent.

Did you negociate the arrangement?—I was present when the agreement was entered into.

Do you know the rent?

Mr. Hill: Was it in writing?—I believe there was a memorandum made at the time. I think the rent was about three hundred and forty pounds a-year; I received it as executor.

Mr. Teed: Did they take any dye-mills?—Yes.

Were those taken of Mr. Berry also?—Those premises were also leased to Mr. Berry, and I think Mr. Berry assigned the lease of those premises for the remainder of the term, but as executors we had no interest in those premises.

Lord Brougham: Do you know where they had carried on business before one thousand eight hundred and thirty?—Yes, in Manchester, in New Cannon-street, Manchester.

In premises of the same extent or less?—They were of considerable extent, but less in extent, but equal in value; the rent was greater for the accomodation.

Mr. Teed: Were the premises they rented of Mr. Berry additional to those in Manchester?—I think they must have carried on the printing elsewhere.

Lord Brougham: Did they continue to carry on the business in the other premises after they took Mr. Berry's premises?—Yes.

Mr. Teed: Do you know whether they procured any additional machinery for the purposes of these patents?—They did.

Do you know to what extent?—I think to the amount of five thousand pounds.

Lord Brougham: You are acquainted with machinery so as to know about its value?—Yes.

That was the machinery they put up in the premises of Mr. Berry?—Yes.

Mr. Teed: Would that machinery be applicable to the ordinary purposes of cotton printing without alteration?—I think not.

Have you any idea what the value of the machinery would be now, supposing it applied to its ordinary purposes?—I cannot say, but it very much depreciates it in value.

Lord Brougham: What would be about the expense necessary to render it applicable to cotton printing?—I am not able to say.

Mr. Teed: You were the arbitrator to whom the differences between Mr. Bennett Woodcroft and his son were referred?—I was.

You made an award?—Yes.

In making the award what value did you set upon the patent right?—I do not think that we made any distinct calculation as to the value of the patent, that was included in the value of the machinery and the stock altogether.

Lord Brougham: Whatever you may have done you must have made up your mind before you made that award; now consider whether you are able to state what value you had put upon it?—It was not valued at much, I think, for it was at a time when the trade was exceedingly flat, and very little doing—and I think we did not estimate the value of the patent at any great sum—a few hundred pounds probably.

About how many hundred pounds?—Mr. Bennett Woodcroft's interest was one-third, and of course we allowed what would be one-third of the value, but there was no specific value agreed.

When you say a few hundred pounds, do you mean that the proportion of one-third was a few hundred pounds, or the value of the whole?—At that time the impression was such with regard to the future prospects of the patent, I should think not more than two or three hundred pounds was considered as Mr. Bennett Woodcroft's interest.

For one-third?—Yes, for one-third.

Mr. Teed: Are you acquainted with the state of the cotton printing trade from the year 1828, downwards?—I was.

Do you know whether or not there was any cause for interfering with the value of the patent after it was granted?—When the patent was granted there was a duty on printed calicoes, and afterwards that duty was repealed; the printing of yarns was not subjected to the duty; of course, the taking off of the print duty on cottons had the effect of reducing the value of these articles that were printed in yarn, because they partook more of the nature of the gingham trade than of printed goods.

Do you know whether that was followed by any increased demand for the ordinary printed goods?—I think a very considerable increase.

Would the increase in the demand for ordinary printed goods have any influence in increasing or diminishing the demand for printed yarns?—Of course, the increased demand for printed goods would necessarily have the effect of reducing the demand for goods made from these printed yarns.

These printed yarns are to produce what you call fancy goods?—Yes.

Is the taste for those goods very variable?—Yes, I suppose there is a fluctuation in the market.

Have you any knowledge of the effect on the manufacturers?—No, I am not a manufacturer of those kind of goods.

Do you know of the invention being used by the silk printers?—I understand it has been used by them.

Lord Brougham: Do you know the fact yourself?—I know it has been used within the last two years by silk manufacturers.

Mr. Teed: Did you negociate any license with any person?—I did, with Messrs. Stone and Kemp of London.

Do you remember when that was?—I think it was in 1829, but I cannot state the precise month.

Do you remember the terms of the license?

Mr. Hill objected to the question until the agreement was produced.

Mr. Teed: Was the agreement in writing?—It was.

Do you know what led to the agreement?

Mr. Hill submitted that the offer leading to an agreement which was reduced to writing—the written agreement must be put in.

Mr. Teed submitted he was at liberty to shew what was the amount offered by any party.

Mr. Hill stated that he should not object to a copy of the license being put in, in place of the original.

Mr. Teed submitted he was at liberty to prove an offer made, and thus to show the reasonableness of the petitioner in the terms he was willing to accept for licenses.

Lord Brougham: Did you make an offer on the part of Messrs. Woodcroft to Messrs. Stone and Kemp?—I accepted an offer—yes, I made an offer.

Mr. Hill submitted that though this would be evidence if an agreement was not made, yet that being incorporated in an agreement, that must be read to show the whole of the terms on which it was granted.

Mr. Brotherton: I think, in fairness, if I state it, I ought to state the circumstances that led to it.

Mr. Teed: Will you look at that memorandum shown to you?—That is simply a receipt.

Mr. Teed stated that this was a memorandum of agreement between Messrs. Stone and Kemp and Woodcroft, by which they should have the use of the license on the payment of a certain price per pound.

Mr. Hill objected to anything but the license itself.

Mr. Teed stated that he had two instruments,—one a memorandum of agreement signed by Mr. Brotherton and Mr. Kemp, as to the price at which they should have the benefit of the license; and the other articles of agreement between Bennett Woodcroft and Stone and Kemp, dated in May, 1839, the license being dated the 24th December, 1839. The memorandum was read, signed by Mr. Brotherton, of a license by Messrs. Woodcroft, at a consideration of three shillings a pound until the termination of the patent—Kemp undertaking to render an account of the silk so printed.

Mr. Teed: That was signed by you?—It was; that is my signature.

Mr. Teed: The sum of three shillings a pound being asked by Mr. Woodcroft, or offered by Mr. Kemp?—It was offered by Mr. Kemp: Might I be allowed to state the facts:—Messrs. Stone and Kemp were printing silk, and

Messrs. Woodcroft considered it an infringement of their patent. Mr. Woodcroft wrote to me—I being in London—to see Messrs. Stone and Kemp on the subject. I had an interview with Mr. Kemp, and he said he had some invention which he conceived was a near approach to the same invention, but that he imagined he had a right to print. I believe he was threatened with an injunction by Mr. Woodcroft, and we went to the patent office to ascertain whether he had a right to do what he was doing under his own patent; he found he had not a right, and he proposed to pay three shillings a pound upon all silk he should print, under a license from Mr. Woodcroft. I accepted that offer on the part of Mr. Woodcroft, and that was ratified by him afterwards. That is the simple story.

Lord Brougham: He ought to pay three shillings per pound during the continuance of the patent?—Yes.

Mr. Teed: Do you know that Messrs. Woodcroft have been willing to grant licenses at the same rate to other persons?—Mr. Woodcroft told me he had not refused any licenses, but I know nothing more.

Do you know whether three shillings per pound for silk is a reasonable price?—It is a reasonable price.

Do you know whether this invention could have been brought into use for the purpose of silk manufacture earlier than it was?—I cannot say that; I have no opinion upon the subject; but I have understood it was owing to the change of the trade.

Had you any communication with Messrs. Butterworth and Brooks respecting any infringement of the patent?—Messrs. Butterworth and Brooks had infringed the patent, and it was proper that the matter should be referred to me; and I think I gave a decision on the subject. It was several years ago: I do not recollect the precise time.

Were there any proceedings in the Court of Chancery against them?—Yes.

Mr. Teed stated that he had an order of the Lord Chancellor in the cause of Bennett Woodcroft against Brooks and Payne, sued by the name of Edward Payne, for an injunction to restrain the parties from invading the patent.

Mr. Teed: Do you know what that cost?—I was referee. Butterworth and Brooks agreed to pay £50 towards the costs.

Cross-examined by Mr. Hill: £50 towards the costs you say. They could have very little of equity for £50 certainly. How much were the costs?—I do not know.

Did you make an award between Mr. Bennett Woodcroft and Mr. John Woodcroft?—Yes.

When was that award made?—The partnership was dissolved in 1835; the affairs remained unsettled until 1840. Proceedings were taken by Mr. John Woodcroft against his father, to have a settlement of the account. It was ultimately agreed to refer the whole matter in difference between them to Mr. Pilling and myself, and we appointed Mr. Jonathan Cocker the umpire. Our award was, that Mr. John Woodcroft should pay Mr. Bennet Woodcroft £800.

Mr. Teed put in the award.

Mr. Hill (to Mr. Brotherton): You say, if I understand you right, that you did value this patent, as far as Mr. Bennet Woodcroft was interested in it, at more than between two and three hundred pounds?—We had to consider the value in 1835.

You valued it, as I say, at between two and three hundred?—Yes.

Was there no account, no balance sheet drawn out as the foundation for your award?—Of course we received the evidence of both parties as to the state of the account, and made an award according to the evidence submitted to us.

[*To be continued.*]

List of Patents

That have passed the Great Seal of Ireland, from the 17th of February to the 17th of March, 1841, inclusive.

To Peter Fairbairn, of Leeds, in the county of York, engineer, and William Suttill, of Newcastle-upon-Tyne, flax spinner, for certain improvements in drawing flax, hemp, wool, silk, and other fibrous substances.—Sealed 3rd March—6 months for inrolment.

John Clay, of Cottingham, in the county of York, gent., and Frederick Rosenborg, of Sculcoates, in the same county, gent., for improvements in arranging and setting-up types for printing.—Sealed 6th March—6 months for inrolment.

Peter Bradshaw, of Dean, near Kimbolton, in the county of Bedfordshire, gent., for improvements in dibbling and drilling corn, seeds, plants, roots, and manure.—Sealed 6th March—6 months for inrolment.

Robert Cooper, of Pebworth, near Evesham, in the county of Gloucester, gent., for improvements in ploughs.—Sealed 6th March—6 months for inrolment.

List of Patents

Granted for Scotland subsequent to February 22nd, 1841.

To William Orme, of Stourbridge, iron-master, for improvements in the manufacture of cofered spades, and other cofered tools. —Sealed 23rd February.

William Pierce, of Islington, for certain improvements in the preparation of wool and other animal fibres, both in the raw and manufactured state; by means of which the quality will be considerably improved.—Sealad 24th February.

Theophilus Richards, of Birmingham, for improvements in cutting or sawing wood,—being a foreign communication.—Sealed 26th February.

Francis Sleddon, jun., of Preston, machine-maker, for certain improvements in machinery or apparatus for roving, slubbing, and spinning cotton and other fibrous substances.—Sealed 2nd March.

Hugh Lee Pattinson, of Bensham-grove, near Gateshead, manufacturing chemist, for improvements in the manufacture of white lead.—Sealed 3rd March.

Charles Cameron, lately Captain in Her Majesty's 18th Regiment of Foot, at present residing at Mount Vernon, county of Edinburgh, for certain improvements in engines to be actuated by steam or other elastic fluids.—Sealed 3rd March.

Paul Hammic, of Paris, but now of Manchester, solicitor, for certain improvements in the construction of governors or regulators, applicable to steam-engines and to other engines used for obtaining motive power,—being a foreign communication.—Sealed 3rd March.

Charles de Bergue, of Sydenham, Kent, for certain improvements for making reeds used in weaving,—being a foreign communication.—Sealed 3rd March.

William King Westley, of Leeds, flax machinist, for certain improvements in carding, combing, straightening, cleaning, and preparing for spinning, hemp, flax, and other fibrous substances.—Sealed 6th March.

Robert Urwin, of South Shields, engineer, for certain improvements in steam-engines.—Sealed 9th March.

Walter Richardson, of Regent-street, London, and George Mott Braithwaite, of Chelsea, for improvements in tinning metals,—being a foreign communication.—Sealed 11th March.

John Rand, of Howland-street, London, for improvements in preserving paints and other fluids.—Sealed 16th March.

Thomas William Booker, of Melen Griffith Works, near Cardiff, iron-master, for improvements in the manufacture of iron.—Sealed 16th March.

Charles Edwards Amos, of Great Guilford-street, Southwark, for certain improvements in machinery or apparatus used in the manufacture of paper.—Sealed 18th March.

William Handcock, jun., of King-square, Goswell-road, London, accountant, for an improved description of fabric suitable for making friction gloves, horse brushes, and other articles requiring rough surfaces, and the method of manufacturing the same.—Sealed 19th March.

Frederick Steiner, of Hyndburn Cottage, near Accrington, Lancaster, Turkey-red dyer, for improvements in looms for weaving and cutting asunder double-piled cloths, and a machine for winding weft to be used therein,—being a foreign communication.—Sealed 19th March.

Matthew Uzielli, of King William-street, London, merchant, for improvements in impregnating and preserving wood and timber for various useful purposes,—being a foreign communication. —Sealed 22nd March.

New Patents

SEALED IN ENGLAND.

1841.

To George England, of Westbury, Wiltshire, clothier, for improvements in machinery for weaving woollen and other fabrics; and for twisting, spooling, and warping woollens; also for improvements in the manufacture of woollen doe-skins.—Sealed 2nd March—6 months for inrolment.

John Wilkie, of Nassau-street, Marylebone, upholsterer, and John Charles Schwieso, of George-street, St. Pancras, musical instrument-maker, for their invention of improvements in constructing elastic seats or surfaces of furniture. —Sealed 2nd March—6 months for inrolment.

Henry Newson Brewer, of Jamaica-row, Bermondsey,

mast and block-maker, for an improvement or improvements in wooden blocks for ships' rigging, tackles, and other purposes, where pullies are used.—Sealed 3rd March—6 months for inrolment.

John Rand, of Howland-street, gent., for improvements in preserving paints and other fluids.—Sealed 6th March—6 months for inrolment.

James Johnson, of Glasgow, gent., for certain improvements in machinery for the manufacture of frame-work knitting, commonly called hosiery; and for certain improvements in such frame-work knitting or hosiery.—Sealed 8th March—6 months for inrolment.

Thomas Spencer, of Liverpool, carver and gilder, for an improvement or improvements in the manufacture of picture and other frames, and cornices; applicable also to other useful and decorative purposes.—Sealed 8th March—6 months for inrolment.

John William Neale, of William-street, Kennington, engineer, and Jacque Edouard Duyck, of Swan-street, Old Kent-road, commission agent, for certain improvements in the manufacture of vinegar, and in the apparatus employed therein.—Sealed 8th March—6 months for inrolment.

John Varley, of Bayswater-terrace, Bayswater, artist, for an improvement in carriages.—Sealed 8th March—6 months for inrolment.

Benjamin Smith, of Stoke Prior, Worcester, butcher and publican, for an improved apparatus for making salt from brine.—Sealed 8th March—6 months for inrolment.

John Walker, of Crooked-lane, King William-street, builder, for an improved hydraulic apparatus.—Sealed 8th March—6 months for inrolment.

Richard Lawrence Sturtevant, of Church-street, Bethnal-green, soap manufacturer, for certain improvements in the manufacture of soap.—Sealed 8th March—6 months for inrolment.

Thomas Joseph Ditchburn, of the Orchard House, Blackwall, ship-builder, for certain improvements in ship-building, some, or all of which, are applicable to steam boats, and boats and vessels of all descriptions.—Sealed 8th March —6 months for inrolment.

Anthony Todd Thomson, of Hinde-street, Manchester-square, doctor of medicine, for an improved method of manufacturing calomel and corrosive sublimate.—Sealed 8th March—6 months for inrolment.

Stephen Goldner, of West-street, Finsbury-circus, merchant, for improvements in preserving animal and vegetable substances and liquids.—Sealed 8th March—6 months for inrolment.

John Wertheimer, of West-street, Finsbury-circus, printer, for improvements in preserving animal and vegetable substances and liquids,—being a communication.—Sealed 8th March—6 months for inrolment.

Thomas Clark, professor of chemistry in Marischal College, University of Aberdeen, for a new mode of rendering certain waters (the water of the Thames being among the number) less impure and less hard, for the supply and use of manufactories, villages, towns, and cities.—Sealed 8th March—6 months for inrolment.

John Baptist Fried Wilhelm Heimann, of Ludgate-hill, merchant, for improvements in the manufacture of ropes and cables,—being a communication.—Sealed 8th March—6 months for inrolment.

John Dockree, of Galway-street, Saint Luke's, gas fitter, for an improvement or improvements on gas burners.—Sealed 15th March—2 months for inrolment.

Richard Laming, of Gower-street, Bedford-square, surgeon, for improvements in the production of carbonate of ammonia.—Sealed 15th March—6 months for inrolment.

William Newton, of the Office for Patents, 66, Chancery-lane, civil engineer and patent agent, for certain improve-

ments in machinery or apparatus for picking and cleaning cotton and wool,—being a communication.—Sealed 15th March—6 months for inrolment.

Robert Warington, of South Lambeth, gent., for improvements in the operation of tanning.—Sealed 16th March —6 months for inrolment.

Joseph Maudslay, of Lambeth, Engineer, for an improvement in the arrangement and combination of certain parts of steam-engines, to be used for steam navigation.—Sealed 16th March—6 months for inrolment.

William Newton, of the Office for Patents, 66, Chancery-lane, civil engineer and patent agent, for improvements in spinning and twisting cotton and other materials capable of being spun and twisted,—being a communication.—Sealed 16th March—6 months for inrolment.

George Lowe, of Finsbury-circus, engineer to the Chartered Gas Company, for improved methods of supplying gas, under certain circumstances, and of improving its purity and illuminating power.—Sealed 16th March—6 months for inrolment.

Charles Bunt Dyer, of Pary's mine, Anglesea, mine agent, for an improved method of obtaining paints or pigments, by the combination of mineral solutions with other substances.—Sealed 16th March—6 months for inrolment.

Lawrence Kortright, of Oak Hall, East Ham, Essex, Esq., for certain improvements in treating and preparing the substance commonly called whalebone, and the fins and such like other parts of whales, and rendering the same fit for various commercial and useful purposes,—being a communication.—Sealed 17th March—6 months for inrolment.

William Thompson Clough, of St. Helens, Lancaster, alkali manufacturer, for improvements in the manufacture of the carbonates of soda and potash,—being a communication.—Sealed 17th March—6 months for inrolment.

Henry Augustus Wells, of Regent-street, gent., for improvements in machinery for driving piles,—being a communication.—Sealed 17th March—6 months for inrolment.

Joshua Field, of Lambeth, engineer, for an improved mode of effecting the operation of connecting and disconnecting from steam-engines the paddle wheels used for steam navigation.—Sealed 22nd March—6 months for inrolment.

Richard Barnes, of Wigan, Lancaster, engineer, for certain improvements in machinery or apparatus for raising or drawing water or other fluids.—Sealed 22nd March—6 months for inrolment.

Anthony Theophilus Merry, of Birmingham, refiner of metals, for an improved process or processes for obtaining zinc and lead from their respective ores, and for the calcination of other metallic bodies.—Sealed 22nd March—6 months for inrolment.

Robert Walter Winfield, of Birmingham, merchant, for certain improvements in or belonging to metallic bedsteads, a portion of which may be applied to other articles of metallic furniture.—Sealed 22nd March—6 months for inrolment.

Robert Goodacre, of Ullesthorpe, Leicestershire, for an improved mode of weighing bodies raised by cranes or other elevating machines.—Sealed 22nd March—6 months for inrolment.

David Napier, of Millwall, engineer, for improvements in propelling vessels.—Sealed 22nd March—6 months for inrolment.

Achille Elie Joseph Soulas, of George-yard, Lombard-street, merchant, for improvements in apparatus for regulating the flow of fluids,—being a communication.—Sealed 22nd March—6 months for inrolment.

William Bucknell, of Westminster, gent., for improvements in applying heat for the purpose of hatching eggs, which improvements are also applicable to other useful

purposes where heat is required.—Sealed 22nd March—6 month for inrolment.

Morris West Ruthven, of Rotherham, engineer, for a new mode of increasing the power of certain media when acted upon by rotary fans, or other similar apparatus.—Sealed 22nd March—6 months for inrolment.

Robert Cook and Andrew Cunningham, of Johnstone, near Glasgow, engineers, for improvements in the manufacture of bricks.—Sealed 22nd March—6 months for inrolment.

Moses Poole, of Lincoln's Inn, gent., for improvements in stretching cloths,—being a communication.—Sealed 22nd March—6 months for inrolment.

Joseph Wright, of Carisbrook, Isle of Wight, mechanic, for improvements in apparatus used for dragging or skidding wheels of wheeled carriages.—Sealed 22nd March—6 months for inrolment.

Thomas Wright, of Church-lane, Chelsea, Lieutenant in Her Majesty's Navy, for certain improvements applicable to railway and other carriages.—Sealed 22nd March—6 months for inrolment.

Edward Finch, of Liverpool, iron-master, for improvements in propelling vessels.—Sealed 25th March—6 months for inrolment.

Goldsworthy Gurney, of Bude, Cornwall, Esq., for improvements in the production and diffusion of light.—Sealed 25th March—6 months for inrolment.

CELESTIAL PHENOMENA for April, 1841.

D.	H.	M.	
1			Clock before the sun, 3m. 58s.
—			☽ rises 0h. 57m. A.
—			☽ passes mer. 8h. 41m. A.
—			☽ sets 3h. 45m. M.
	15	23	♃'s first satt. will im.
	19	3	☿ stationary.
		51	♀ greatest hel. lat. N.
3	7	42	☿ in the descending node.
5			Clock before the sun, 2m. 46s.
—			☽ rises 6h. 30m. A.
—			☽ passes mer. 11h. 53m. A.
—			☽ sets 4h. 49m. M.
	12	36	♃ stationary
6	11	31	Ecliptic oppo. or ○ full moon
6	22	17	♂ in conj. with the ☽ diff. of dec. 7. 29. N.
8	23	5	♀ at greatest brilliancy.
9	9		Vesta in conj. with Her:
10			Clock before the sun, 1m. 20s.
—			☽ rises Morn.
—			☽ passes mer. 3h. 11m. M.
—			☽ sets 6h. 39m. M.
	14	17	♃ in conj. with the ☽ diff. of dec. 4. 53. N
11	12	38	♄ stationary
	15	53	♄ in conj. with the ☽ diff. of dec. 4. 31. N.
12	20		☽ in Apogee.
13	10	5	☽ in □ or last quarter.
13	11	12	☿ in Aphelion.
14	12	38	☿ in conj. with Ceres.
15			Clock before the sun, 0m. 1s.
—			☽ rises 2h. 55m. M.
—			☽ passes mer. 7h. 18m. M.
—			☽ sets 11h. 51m. M.
—			Mercury R.A. 23h. 56m. dec. 2. 43. S.
—			Venus R. A. 3h. 50m. dec. 25. 57. N.
—			Mars R. A. 13h. 49m. dec. 9. 21. S.
—			Vesta R. A. 23h. 41m. dec. 6. 50. S.
—			Juno R. A. 11h. 41m. dec. 6. 30. S.
—			Pallas R. A. 22h. 13m. dec. 5. 45. N.
—			Ceres R. A. 23h. 55m. dec. 9. 31. S.
—			Jupiter R. A. 17h. 15m. dec. 22. 22. S.
—			Saturn R. A. 18h. 13m. dec. 22. 2. N.
—			Georg. R. A. 23h. 32m. dec. 3. 44. S.
—			Mercury passes mer. 22h. 22m.
—			Venus passes mer. 2h. 16m.
—			Mars passes mer. 12h. 13m.
—			Jupiter passes mer. 15h. 38m.
—			Saturn passes mer. 16h. 36m.
—			Georg. passes mer. 21h. 55m.
—			Occul d^1 Capricornus, im. 15h. 57m.
—			Occul d^2 Capricornus im. 16h. 7m. em. 16h. 36m.
17	3	19	☿ greatest elong. 27. 21. W.
	13	39	♃'s first satt. will im.
	13	56	♂ in oppo. to the ☉
18	8	22	Her: in conj. with the ☽ diff. of dec. 4. 15. S.
	13	8	♃'s third satt. will em.
19	4	8	☿ in conj. with the ☽ diff. of dec. 6. 59. S.
20			Clock after the sun, 1m. 9s.
—			☽ rises, 4h. 3m. M.
—			☽ passes mer. 10h. 57m. M.
—			☽ sets 6h. 9m. A.
21	2	32	Ecliptic oppo. or ● new moon.
23	6	31	♀ in conj. with the ☽ diff. of dec. 0. 59. N.
	8	25	♀ stationary.
24	15	33	♃'s first satt. will im.
24	22		☽ in Perigee.
25			Clock after the sun, 2m. 8s.
—			☽ rises 6h. 43m. M.
—			☽ passes mer. 3h. 42m. A.
—			☽ sets Morn.
	13	17	♃'s second satt. will im.
	14	42	♃'s third satt. will im.
28	8	57	☽ in □ or last quarter.
—			Occul π^2 Cancri im. 8h. 28m.
29			Occul A Leonis im. 7h. 37m.
30			Clock after the sun 2m. 55s.
—			☽ rises, 1h. 33m. A.
—			☽ passes mer. 8h. 16m. A.
—			☽ sets 2h. 27m. M
—			Occul p^2 Leonis im. 13h. 3m. em. 13h. 59m.

J. LEWTHWAITE, Rotherhithe.

THE

London

JOURNAL AND REPERTORY

OF

Arts, Sciences, and Manufactures.

CONJOINED SERIES.

No. CXII.

Recent Patents.

To THOMAS AITKIN, *of Chadderton, in the county of Lancaster, manufacturer, for his invention of certain improvements in the machinery or apparatus for drawing cotton and other fibrous substances.*—[Sealed 28th January, 1840.]

THESE improvements in the machinery or apparatus for drawing cotton and other fibrous substances, consist in the construction and arrangement of certain mechanism, and in the application of the same to ordinary drawing-frames, used in the preparation of cotton and other fibrous substances. They are designed for the purpose of forming a more perfect and even "drawing," (as it is termed); that is,—causing the ordinary drawing-frame to prepare the filament or sliver of cotton, as it comes from the carding-engine, and is proceeding to the slubbing or roving process,

consequently to draw it in an even and level state, and prevent the possibility of forming an uneven sliver or drawing, by ensuring it entirely free from any knots, lumps, or other inequalities of thickness throughout; and also preventing the occurrence of thin, or, as it is termed, "single" places in the drawing, owing to any one of the slivers, which are being converted into a drawing, breaking off or otherwise failing, from the can becoming empty, or any other accidental cause. This improvement is effected by means of a self-acting apparatus, which is caused to throw the strap off the driving pulley of the drawing machine, and, thereby to stop its revolutions, simply by the breaking or failure of any one of the slivers or filaments of cotton from the carding-engine, which are under the process of drawing.

Having above stated the object of my improvements, I will proceed to describe the particular construction of the apparatus, and also the operations of the same, in order to illustrate its practical application to ordinary drawing-frames; and, in order that my invention may be fully explained, and more perfectly understood, I have attached to these presents a sheet of drawings, containing several representations of my improvements, and have marked the same with figures and letters of reference,—having placed similar letters upon corresponding parts of the mechanism in all the figures; and I would here remark, that for the sake of illustration, I have represented, in the drawings attached, all the general parts of an ordinary drawing-frame, in connection with those parts which constitute my improvements.

Plate VII., fig. 1, is a front elevation of that side of a drawing frame at which the slivers of cotton enter as they are brought from the carding-engine, and representing my improvements attached; fig. 2, is a plan or top view of the

same; and fig. 3, is a partial section, taken through about the middle of the machine. The ordinary parts of the drawing-frame are shewn at A, A, which represent the side standards; B, B, the drawing rollers; and C, C, the conducting rollers, which lead the slivers, as they are drawn, into the cans below. The slivers of cotton from the carding-engine, shewn as being formed into a "drawing," are seen at E, E, E, E.

The small apparatus which forms the main feature of my invention, is represented enlarged, in fig. 3, and as applied to the drawing-frame at *a, a, a, a,* in figs. 1 and 2. It consists of a small cone or trumpet, which is supported by swivels upon the centres *b,* each cone in the series being independent of the others.

Now, as the slivers E, E, are introduced into the drawing-machine, they are collectively passed through the larger cone *c,* (which is formed in a plate, and fixed in front of the machine, but removed in figs. 1 and 2, to shew the other parts more clearly); hence they proceed separately through the smaller cone *a, a, a, a,* passing between the feeding rollers *d, d,* to the ordinary drawing rollers B, B. The cones or trumpets *a, a,* are kept in their upright positions, simply by the tension of the sliver as it passes through them; and thus it will be seen, that should any knot, lump, or inequality be arrested, and the sliver held by the larger cone *c,* or any weak thin place occur after it has passed this cone, the feeding rollers still revolving, will pull the sliver and break it off, which will immediately cause the small cone *a,* to fall back on its centre, as drawn in dotted lines in fig. 3; and its weighted end *e,* will strike against the wire *f,* and cause the bell-crank lever *g,* upon the shaft *h,* to run up a notch in the inclined slot *i,* cut in the strap-lever *k, k,* (see plan, fig. 2,) and thus the weight and chain *l, l,* passing round the pulley *m,* and excentric *n,* will

instantly traverse the strap-rod, through the driving-strap *o*, on to the loose pulley, and thus stop the machine, and prevent the drawing making "single" or thin and uneven places. There is a strap-lever *p*, for setting it on again by hand, when the "piecing" is made, and also a stud or pin *q*, for throwing the strap off by hand if desired.

The top feeding roller may be easily raised by depressing the compound hand-lever *r*, in the direction of the arrow, as shewn by the dotted line. Fig. 4, shews one of the cones *a*, with the larger cone *c*, fixed upon it, and falling with it, instead of being formed in a plate and fixed upon the machine;—this, in some cases, may be preferable, owing to the increased friction obtained. It will be seen that these cones are also provided with a moveable lip and retaining spring, which is designed for the purpose of allowing any slight inequality to pass through without breaking the sliver, providing it is so small as not to injure the evenness and regularity of the drawing.

Having now explained the object of my improvements, and the manner of carrying the same into practical operation, I desire it to be understood, that I claim, as my invention, the particular construction of mechanism or apparatus, and the application of the same to drawing-frames or machines for drawing cotton and other fibrous substances, as shewn in the drawings attached to these presents, and above particularly described; and also the application of the funnel or cone *a*, working on a swivel or centre, for the purpose either of giving an alarm, or stopping the machinery in all situations where it may be applied.—[*Inrolled in the Petty Bag Office, July*, 1840.]

To John Upton, *late of New-street, Southwark Bridge-road, but now of Horsleydown-lane, in the county of Surrey, engineer, for his invention of an improved method or methods of generating steam power, and applying the same to ploughing, harrowing, and other agricultural purposes; which method or methods is or are also applicable to other purposes to which the power of steam is or may be applied.*—[Sealed 4th November, 1837.]

This invention is said to consist firstly,—in improvements in the construction of boilers for generating steam; and, secondly,—in improvements in rotary engines, which may be employed for working ploughs, harrows, and other agricultural instruments.

The improved boiler is shewn in vertical section in Plate VII., at fig. 5. It is constructed of series of tubes containing water, placed within a box or casing, in which the fuel is made to burn; and its flame and heated vapours playing against the outer surface of the tubes, causes the water to boil within the tubes, and the steam to be thereby generated.

A horizontal cylindrical tube *a*, receives the water from a tank by a suitable pipe not shewn in the figure; and *b*, is a similar tube, but of larger diameter, situate above, into which the water flows from the former, and the steam rises through the several tubes. Two series of vertical tubes *c*, *c*, bent at top and bottom, are inserted at their ends, into the two horizontal cylinders *a*, and *b*, and thereby form communications for the flow of the water. Two other series of bent tubes *d*, *d*, are likewise inserted into the horizontal cylinders, and form communications therewith.

These two series of bent tubes *d*, *d*, cross each other, and at the parts where they intervene, constitute a grating to hold the upper fire *e*; there is also a lower fire, *f*, sup-

ported upon a grating formed by the lower junctions of these tubes with the cylinder *a*, the smoke from which is consumed as it passes through the upper fire.

By this arrangement of the tubes, the patentee considers that no deposit or incrustation will take place within the tubes constituting the boiler, and that if any should collect in the lower part, it can be easily blown out in the usual way; and that by the disposition of the fire-places on grating, formed by hollow tubes, there will be no liability of clinkers being produced.

The improved rotary steam-engine is shewn in vertical section at fig. 6; *a, a*, is an external stationary cylinder; *b, b*, an internal rotary cylinder; and *c, c*, the crescent-formed steam channel between them, which is terminated by the steam-stops at *d, d*.

Four sliding pistons *e, e*, and *f, f*, are employed, the two *e, e*, being connected by a rod which slides through the cylinder *b, b*, and through the axle or central shaft *g*; and the other two *f, f*, are in like manner connected, and slide in the same way at right angles to the former.

Steam from a boiler passes down the pipe *h*, and through the induction aperture *i*, into the steam channel *c*, where pressing against the face of the piston *e*, its elastic force causes the piston to be driven round the channel, and with it the inner cylinder *b*, and the axle *g*, to revolve also.

The steam-stops *d, d*, are curved terminations to the steam channel *c*, which, as the cylinder *b*, goes round at this time, forces back one of the pistons *f*, into the recess in the cylinder, and projects the other piston *f*, forward, into the steam channel *c*, where the elastic force of the steam as in the former instance acting against the face of the piston *f*, impels it round in the circular channel.

The piston *e*, first mentioned, is now in its turn brought against the curved steam-stop, and is forced into the cylinder, at which time the volume of steam that had impelled

it forward, escapes through the eduction aperture *k*, and passes off by the pipe *l*, into the atmosphere,—or it may be conducted downwards to a condenser below.

Thus, it will be perceived, that the pistons being connected together in pairs by rods passing through the central shaft, and their outer edges fitting closely against the surfaces of the steam channel, when one piston is made to expose the whole of its face to the effect of the steam, the fellow piston is kept close within its recess; and that, as one of the pistons retire out of the steam channel, its fellow comes into action at the opposite part of the steam channel.

These improved constructions of boiler and steam engine, being mounted upon and firmly secured to a suitable carriage, may be attached by chains or other means to ploughs, harrows, and other agricultural implements, and made to move them over the land instead of drawing them by horses.

The patentee says that, he does not claim any of the parts of the boiler or engine above described, as being in themselves separately new, but he claims the general arrangement and combination of parts of which the boiler and rotary engine respectively consist, and which constitutes the new method or methods of generating power and applying the same to the purposes above named.—[*Inrolled in the Inrolment Office, May,* 1838.]

To John Joseph Charles Sheridan, *of Ironmonger-lane, in the city of London, chemist, for his improvements in the manufacture of soda.*—[Sealed 31st August, 1837.]

The apparatus for making soda, consists of two kilns in the

form of cones; the first of these kilns is enclosed by a second cone, and the second by a third cone.

Round each of the second, and within the external cones, are arranged six furnaces, the flues from which pass upwards between the first and second cones, in order to heat the internal cone; the latter of which is further heated by three flues, which extend across between the furnaces beneath the floor. The two internal cones communicate with each other by a pipe, which passes from the top of the smallest cone, and enters the top of the second cone; it then proceeds downward and terminates at four feet from the bottom, being heated in its length by the flues from the furnaces.

The operation of making soda is as follows:—The fires in the furnaces are lighted, and as soon as the cones have attained a bright red heat, a quantity of common salt is placed in the smaller internal cone, and the salt being decomposed, its vapour passes through the pipe into the second cone, where it is exposed to the action of steam, which has the effect of turning it into soda.

The muriatic acid formed by the chlorine of the salt, and the hydrogen produced by the decomposition of the water, is carried off through a pipe, either into a condenser or into the atmosphere.

A stream of hydrogen, injected into the cone containing the salt in vapour, would have the same effect as the steam.

The patentee claims the mode of procuring soda by the decomposition of common salt, caused by bringing the salt when in a state of vapour into contact (at the temperature of a bright red heat) with the steam of water, or with hydrogen, at a very high temperature.—[*Inrolled in the Inrolment Office, February,* 1838.]

To William Newton, *of the Office for Patents,* 66, *Chancery-lane, civil engineer, for certain improvements in engines, to be worked by air or other gases,—being a communication from a foreigner residing abroad.*— [Sealed 17th January, 1839.]

These improvements, as communicated to the patentee from France, are described as consisting, firstly,—in a combination of apparatus or machinery, the parts of which, taken separately, are known; by means of which combination the mechanical force obtainable from the alternate dilatation and condensation of a body of air or gas, by transferring it alternately from a heated to a cold medium, and from a cold back to a heated medium, is produced and transmitted to actuate machinery in a more efficient manner than has hitherto been practised. And the said improvements consist, secondly,—of certain other particulars which will be hereinafter described and ascertained.

The several known parts of apparatus or machinery, the combination of which forms the first part of the said improvements, are, firstly,—a vessel adapted to contain the air or gas, and to perform the double office of a heating vessel and of a condenser; one end of such vessel being for that purpose exposed to heat, while the other is surrounded by cold water, or otherwise kept cool; secondly,—a vessel adapted to fit into the vessel above mentioned, not, however, so as to fill the same entirely, but leaving a sufficient vacant space therein to contain a body of air or gas, and performing, (by means of suitable motions given to it,) the operation of displacing, when moved in one direction, the body of air or gas contained in the heated space, at one end of the air vessel; and when moved in the opposite direction, the body of cooled air or gas contained at the opposite end of the said

vessel; and thirdly,—in apparatus or machinery, so constructed and connected with the air vessel, as to transmit the mechanical force, resulting from the alternate dilation and contraction of the air, through the medium of water or some other similar fluid of the kind commonly called incompressible.

In Plate VIII., at fig. 1, is represented the simplest form of the engine, embodying the aforesaid combination of parts. *a, a, b, b,* are two cylindrical vessels, closed both at top and bottom, which are to contain the air or gas intended to work the engine, and which are called, throughout the following description, the air cylinders. They are enclosed by external cylinders *c, c*; the upper ends of which communicate, by apparatus *d, d,* with a furnace F, while their lower ends are filled with cold water at *e, e.*

The lower ends of the air cylinders communicate, by bent pipes, *g, h,* with a cylinder B, which is called the working cylinder; the air cylinder *b,* communicating with the upper part thereof, above the piston C, while the other air cylinder *a,* communicates with the lower part of the working cylinder beneath the piston C. The working cylinder B, and pipes *g, h,* are filled with water or some other incompressible fluid, as shewn in fig. 1. The principle on which the quantity of water is to be regulated, will be stated hereinafter.

D, and E, are the displacing vessels.—They are hollow cylinders, closed at both ends, and filled with some substance, being a non-conductor of heat, and are made shorter than the air cylinders *a, a,* and *b, b,* (see the figure,) and of less diameter, so as to slide up and down very freely, and leave a very narrow annular space between such displacing vessels and the internal surfaces of the air cylinders.

To the lower ends of the displacing vessels D, E, are affixed stems or rods *l, l,* which pass through stuffing-boxes,

in the bottoms of the outer cylinders or cases *c*, *c*, and are used for moving the displacing vessels D, and E, up and down, as will be hereinafter explained. F, is the furnace, and G, its chimney. The heated air and flame from the furnace pass through the openings *d*, *d*, into the cases *c*, *c*, and circulate in the spaces around the air cylinders *a*, *a*, *b*, *b*, which spaces serve as flues; and thence such hot air and flame passes through the pipe H, in which are registers 1, 2, to regulate the draft into the chimney G. *i*, *i*, is an external casing or jacket, filled with some non-conducting material, and enveloping the upper part of the apparatus, to prevent the loss of heat from the furnace and upper part of the air cylinders, by radiation.

The cold water reservoirs or condensing cisterns, at *e*, *e*, must be kept regularly supplied with fresh liquor, as the water in them becomes heated by the working of the engine;—that will be done by means of pumps, wrought by the engine, but which it is not thought necessary to shew on the drawings, as there needs be nothing peculiar about such pumps, or the mode of working them.

The operation of the engine, delineated in fig 1, is as follows:—I will first observe that, in order to avoid repetition, we will suppose that common air is intended to be used to work it, and that it is intended to work the engine on the footing of keeping up such temperatures, at the heating and condensing ends of the two air cylinders respectively, that the body of air, contained in each cylinder, shall occupy, when in its expanded state, at the heated end, double the space occupied by it, in its state of contraction, at the condensing end, (as shewn in fig 1,) where the body of air 3, which is in its expanded state, is shewn as occupying twice the space 4, where the body of air is cooled down into its contracted state. On the other hand, the water in the air cylinder *b*, is nearly level with the bottom thereof,

while in the vessel *a*, it rises up to the line 5, so as to occupy so much of the space not occupied by the displacing vessel, as the body of air, by means of its contraction, will not fill.

In the position of the parts, in fig. 1, they are in equilibrio; the pressure exerted by the body of air 3, in the air vessel *b, b*, on the surface of the water in the pipe *h*, being balanced by the pressure of the body of air, and the column of water in the vessel *a, a*; but, if the displacing vessel D, be drawn down, so as to displace the body of cold air 4, while the other displacing vessel E, is raised up, so as to displace the body of hot air 3, then the body of cold air 4, will, on reaching the heated end of the air cylinder *a, a*, become rapidly expanded into double the space which it occupied at 4; while the body of hot air 3, being, by the opposite motion of the displacing vessel E, transferred to the colder condensing end of the air cylinder *b*, will, with like rapidity, be contracted into half the space it occupied at 3. The result will be, of course, an increase of pressure at the upper end of the air vessel *a, a*, which will act, through the medium of the column of air between the displacing vessel D, and the cylinder *a, a*, on the surface of the water at the line 5, causing such surface to sink, and a diminution of pressure in the space beneath the displacing vessel E; therefore the column of water, on the upper surface of the piston C, will be relieved of part of the pressure upon it, while an increased pressure will act on the column of water pressing against the under side of the piston, and, consequently, the said piston will rise with a force, regulated in its intensity by the difference between the pressure of the body of heated and dilated air in one of the cylinders, and the pressure of the corresponding body of cooled and contracted air in the other air cylinder.

If now the motions of the displacing vessels be reversed,

viz., the displacing vessel E, pulled down, and the displacing vessel D, raised, a corresponding change of pressures, on the opposite sides of the fluid in the pipes *g*, and *h*, and the working cylinder B, will take place,—viz., the pressure on the surface of the fluid, in the air vessel *b, b*, will be increased, and that on the surface of the fluid in the air vessel *a, a*, will be diminished; the fluid will therefore descend in the vessel *b, b*, rise in the vessel *a*, and will cause the working piston C, to make a descending stroke; and thus the reciprocating action of the piston C, will be continued so long as alternate up-and-down motions are given to the displacing vessels D, and E.

The diameter and length of the stroke of the working piston C, and the quantity of water or other fluid, used to transmit the mechanical force produced by the engine, are so proportioned, with reference to the capacities of the vacant spaces left for the air at the ends of the air cylinders, respectively, that at each stroke of the piston C, the volume of water displaced, will be equal to the capacity, filled with cold air, at 4, in the cylinder *a, a*; and to half the capacity, represented as filled with hot air, at 3, in the cylinder *b, b*.

The heated air, in descending to the lower ends of the air cylinders, will of course give out part of its heat to the surfaces of these cylinders and of the displacing vessels, in the middle of their lengths. That heat, or a considerable part thereof, will be taken up again by the cold air in passing up from the condensing ends of the air cylinders to their heated ends; and, to increase this effect, the spaces between the air cylinders and displacing vessels, in the middle parts of their lengths, are partially filled, when the engine is made on a large scale, with very thin plates of metal, coiled or laid round them, so as to expose a very large surface; or, instead of such coils of thin plates, one or more concentric cylinders, of extremely thin metal, or

wire gauze, may be slipped over the displacing vessels in the spaces between them and the air cylinders. In an engine of the dimensions shewn in fig. 1,* such apparatus would however not be necessary or convenient.

The lower ends of the displacing vessels may be provided with a series of plates of thin metal, fastened one to the other, as seen at 7 and 8, fig. 1; which, when the said displacing vessels are drawn down, descend into the condensing water, at the lower ends of the air vessels, and becoming cooled, thereby assist, when the body of heated air is brought down to the lower ends of the air vessels, in cooling the same more rapidly.

The piston rod of the working piston c, will be connected, by suitable intermediate machinery, with a fly-wheel, and other necessary parts, to transmit the motion of the piston c. To actuate any mill-work or machinery, the engine must be first started by hand; but, after it has been started, its motion will be kept up by connecting the rods or stems *l*, *l*, of the displacing vessels, with cams, turned round by or from the axis of the fly-wheel; such cams being of proper forms alternately to raise and allow the descent of each displacing vessel D, E, at the proper time for reversing the motion of the piston c.

I will not at present describe, in detail, the arrangement of the mechanism for removing the displacing vessels; and note,—I have described the engine as of double action, with two air cylinders and displacing vessels, that it is plain that a single-stroke engine may be constructed on the same plan, having a suitable counter-weight, as in the single-acting engine.

I will now proceed to describe another and more complex arrangement of an engine, constructed according to

* Represented in the Plate at one-fortieth of the real size.

the same improvements. The said engine is represented in figs. 2, 3, and 4, in which I have shewn the working parts necessary for keeping up the action of the said engine; but the general features and properties of the engine, (figs. 2, 3, and 4,) are the same as those of the engine already described. Fig. 2, is a sectional view of the engine, taken at the line Y, Y, of the sectional plan, fig. 3, which is taken at the line Z, Z, of figs. 2 and 4; and fig. 4, is a transverse section, taken at X, X, fig. 3. The engine stands on four columns 2, 2, (see fig. 2,) fixed to a ground plate 3. To the upper ends of these columns is bolted a strong cast-iron plate 4, having cast out of it two large pipes or passages 5 and 6; one of which, viz., the one marked 5, is in communication, by a pipe, such as *h*, fig. 1, with the upper part of a cylinder, such as the cylinder B, fig. 1, above the piston thereof; and the other, marked 6, by a pipe, such as *g*, fig. 1, with the lower part of such cylinder below the working piston. It has not been thought necessary to shew such working piston and cylinder, and the communication pipes, corresponding to *g*, and *h*, in the drawing.

The air or gas vessels *a, a, b, b*, are 12 in number, arranged in two detachments of two rows of three each, (see the plan, fig. 3,) bolted down on the plate 4, which is covered with leather, to serve as a packing, to make the joints of the air vessels *a, a*, and *b, b*, air-tight, the plate 4, serving as a bottom to them. The air vessels *a, a*, and *b, b*, communicate by passages 7 and 8, respectively, (see fig. 4, in particular,) with the pipes 5 and 6; corresponding to the detachment of which, they form, respectively, parts, viz., the vessels *a*, with the pipe 6, and the vessels *b*, with the pipe 5; and the six air vessels are in communication with each other, by small pipes 9 and 10, (see fig. 2,) so that the positive and negative pressure within all the six air vessels *a*, or *b*, of each detachment, acts on the surface

of the water in the pipe 5 or 6, belonging to such detachment, and is consequently communicated to the working piston, (not shewn as aforesaid in the drawing,) as if it proceeded from one air vessel.

Four pillars 11, rise up from the plate 4, which are used to frame the cistern 12, containing the condensing water surrounding the lower ends of the air vessels. The air vessels are not cylinders, as they have been described in reference to fig. 1; but, instead thereof, the air vessels are to be cylindrical for a considerable portion of their length, terminating in long cones. The displacing vessels D, and E, are, of course, of corresponding form, (see the dotted line representing them in fig. 2,) adapted, when raised, to fill up the conical ends of the air vessels.

The furnace F, and its flues, are supported by framework, mounted on a thin plate 13, which is fixed to the upper ends of the pillars 11. The heat of the furnace passes into the flues *f*, *f*, (see fig. 2,) surrounding and heating the upper end of the air vessels, and passes out under the division 14, up the exit flue *g*, and thence through the short pipe 15, into the chimney 16. In the pipe 15, is a register 16, which is connected with regulating apparatus, for the purpose of maintaining a uniform temperature, to avoid any injury which might arise from too great an intensity of heat.

The regulating apparatus is composed of a close vessel 17, (see fig. 2,) filled with common air.—This communicates by a pipe 18, with another close vessel 19, communicating by a passage 20, with the open-topped vessel 21. The vessels 19 and 21, are partly filled with water; and on the surface of the water, in 21, is a float 22, connected by a link 23, with the outer end of an arm 24, put on the square of the axis of the register 16. When, therefore, the heat in the flues raises the temperature of the air in

the air vessels too high, the air in the vessel 17, partaking of such heat, becomes expanded, and depresses the water in the vessel 19, and raising the float in the adjoining vessel 21, partially shuts the register 16,—and *vice versa.*

The mechanism for moving the displacing vessels in this engine, by the motion of the engine itself, is shewn in all the three figures. 24, is a shaft, carrying two cams, 25 and 26; one of them, viz., 25, intended to operate on the displacing vessel E, and the other, viz., 26, on the displacing vessel D.

Corresponding levers 27 and 28, carrying friction rollers 29 and 30, are mounted on two standards 31 and 32. The ends of those levers (see figs. 3 and 4,) branch out into forks, which support frames 33, by links 34; and to each of these frames 33, are keyed the lower ends of the six stems 35, of the corresponding detachments of displacing vessels. The said stems of the displacing vessels passing through stuffing-boxes in the bottom plate 4, of the air vessels, as in fig. 4.

The axis 24, is turned by the fly-wheel shaft A, by means of the bevel gearing, shewn at 36, 37, and 38, in fig. 3, furnished with a clutch-box and handle 39.

Now, the operation of this engine is as follows:—Suppose it to have been started by hand, by turning round the spanner 40, on the axis 24;—now, suppose the six displacing vessels D, to be filling the upper ends of their respective air vessels, the lower ends of which therefore will contain cold air, the other six displacing vessels E, being in the contrary condition, as shewn by figs. 2 and 4, and the upper ends of the six corresponding air vessels containing volumes of heated air;—now, the axis 24, continuing to be turned round in the direction of the arrow, fig. 2, the cams 25 and 26 will, (by acting through the levers and other parts above described,) produce the following action, viz.:—

The cam 25, will, during the first quarter of its revolution, raise the six displacing vessels E, to the tops of their respective air vessels, so as to displace the bodies of heated air in the upper ends thereof; while, during the same time, the other cam 26, will have allowed the six displacing vessels D, to descend down to the level of the water at *x*, fig. 4, in the lower ends of the air vessels *a*, *a*; viz., through a space equal to half the space through which the vessels E, will have been moved. The effect of these motions will be, to have increased the pressure on the surface of the water at *x*, fig. 4, and to have diminished it on the surface of the water at *y*; consequently, the working piston (not shewn as aforesaid) will have commenced *an ascending stroke.* The cam 25, continuing to turn, will then, during its next quarter of a revolution, allow the displacing vessels E, to remain stationary, at the upper ends of their respective air vessels, until the working piston has nearly finished its *ascending stroke;* while, during the same time, by the shape of the cam 26, the other displacing vessel D, will have descended, with the descending surface of the water contained in their corresponding air vessels, nearly to the bottoms of such air vessels.

The third quarter of the cam 25, corresponds to the first quarter of the cam 26, and the fourth to the second; the cams, therefore, continuing to turn, the motions are reversed; viz., the displacing vessels D, will be raised through the whole height through which they are to move, while the displacing vessels E, will be caused to go through half their descending motion; and then the displacing vessels D, will be kept stationary while the displacing vessels E, complete their descent; the effect of which will be to reverse the pressures on the opposite surfaces of the water at *x*, and *y*, and so to cause the *return or descending stroke* of the working piston.

It must be observed, that the cams 25 and 26, should be set forward a little on their axis, that is, they must be set with relation to the working piston, so as to commence reversing the motions of the displacing vessels a little before the end of each stroke of such piston. The object of applying the train of bevel wheels 36, 37, and 38, and the clutch-box 39, by means of which either of the bevel wheels 36 and 37, may be made the driving wheel at pleasure, and the other thrown loose,—is, to allow of reversing the motion of the fly-wheel, without reversing the motion of the engine. This mode of communicating motion is well known, and requires no further explanation.

It remains to be observed upon the construction of the engine, (figs. 2, 3, and 4,) that in order to relieve the cams from the weight of the displacing vessels D, and E, they are suspended by a pair of chains 41 and 42; the lower end of the chain 41, being attached to the levers 27 and 43, (see fig. 2,) and the other chain being attached to the levers 28. The upper ends of these chains are attached to the opposite ends of a vibrating beam 44, moving on a centre at 45, (see fig. 4); and in order to compensate for the different velocities of motion of the opposite set of displacing vessels, hereinbefore mentioned, the centre of the supporting beam itself is hung by a bolt 46, upon springs 47, see figs. 2 and 4. The springs 47, can be adjusted, as to amount of resistance, by the nut 48.

In the spaces between the displacing vessels and the air vessels, coils or laps, in one or more concentric cylinders, of extremely thin metal, not shewn in the drawings, may be placed, if required, for the purpose already stated in reference to fig. 1. It will not however be found, in general, necessary to apply this method of increasing the surface to take up heat from the air, in its passage between the heating and condensing ends of the engine,—in engines in which

the surfaces, exposed by the air vessels themselves, are so large as they are when the construction, figs. 2, 3, and 4, is adopted.

In figs. 5, 6, 7, and 8, Sheet 2, I have represented another mode of constructing an engine, according to the first part of the said improvements. Fig. 5, is a section; fig. 6, a front view; fig 7, a horizontal plan; and fig. 8, a detached plan of a particular part. The engine is to be double, like those already described; that is, to have two air vessels and displacing vessels acting in opposite directions, (see fig. 6); but, they are counterparts of each other in point of construction. The air vessels are each composed of two vessels, viz. firstly,—a cast-iron cylinder *a, a,* the upper end of which is conical, (see fig. 5,) and the lower is a cylinder, of the diameter of the lower end of the cone. Secondly,—an external cylinder *b, b,* firmly riveted to the vessel *a,* at the upper end, with an air-tight joint. To the lower end of such outer cylinder *b,* a flange is riveted, by which it is fastened down upon the upper plate *c, c,* of a strong cast-iron vessel C, C, figs. 5 and 6.

The space 3, between the vessel *a, a,* and its outer cylinder *b,* (see fig. 5,) forms the air chamber or vessel, and is, as will be seen by the drawing, cylindrical, through part of its length, and conical through the remainder. In it is fitted the displacing vessel *d, e,* of a corresponding form and dimension. It may be made, as represented in the drawing, of thin copper, strengthened in the inside by circular plates, which serve at the same time to keep the air, contained in the inside of the displacing vessel, in separate layers, and thereby more effectually render it a bad conductor of heat. To make the displacing vessel slide up and down, truly, on the cylindrical part of the internal vessel *a, a,* two brass collars are fitted at *g, g, g, g.*

To the bottom of each displacing vessel are attached also

two strong elbow bars *h*, *h*, which carry the upright rods or stems *i*, *i*; and to the upper ends of those rods *i*, *i*, the chains *l*, *l*, are fastened, which embrace the arch head of arms *m*, *m*, mounted on axes *n*, *n*, resting in bearings fixed to the beams of wood 2, 2. 4, is the axis of the cams *o*, *p*, which are placed side by side, (see fig. 7); and from each of the arms *m*, on the side of the engine, (see fig. 6,) a bent arm or strong spring *q*, descends, carrying a roller *r*, which bears against the rim of the corresponding cam. The two opposite displacing vessels will, by the arrangement thus made for suspending them, balance each other, except so far as greater pressure on particular parts of the action of the engine on one, than on the other, will disturb their equilibrium; and hence the cams will not be exposed to much friction from the weight of the displacing vessels; but, if requisite to neutralise any effect arising from such weight of the displacing vessel, the arms *m*, *m*, may be respectively balanced by counter weights, hung on the ends of levers, fixed on the axes *n*, *n*, as shewn by dotted lines in fig. 6.

The fire-grate and furnace are represented at *s*, *t*; the furnace being, in fact, formed by the upper end or conical mouth of the interior vessel *a*, *a*, of the air vessel. The fuel is placed in a moveable conical fire-box *s*, all the lower part of which, as well as the bottom, is an open grating, through which the atmospheric air, entering through the cylindrical passage *a*, *a*, at the bottom, (see fig. 5,) can freely obtain access to the fuel contained in such fire-box; and thence, passing up into the furnace, heats the conical sides thereof, and passes through the bent pipes *u*, *v*, into the outer casing 6, 6, of the upper end of the air vessel; and, after circulating all round the same, passes away, through the pipes *v*, *w*, into the chimney *b*.

Between the cylinder *b*, and the displacing vessels, are interposed one or more cylinders, of thin metal or wire

gauze, (see *x*, *x*, fig. 5,) for the purposes herein before mentioned, in reference to the engines figs. 1, 2, 3, and 4. In an engine of this construction, it will, generally, be advisable to introduce them. A lid, not shewn in the drawings, is placed over the mouth of the furnace, and therein a proper fire-door is made, for supplying the fire-box with fuel. The two wells C, C, in which the rods *i*, move up and down, serve at the same time as communication cisterns, to establish the fluid communication between the air vessels and the working piston of the engine, in the cylinder 6, fig. 6.

The two wells or cisterns C, C, belonging to each air vessel, communicate, for that purpose, through a common pipe D, (see fig. 5,) to another pipe E, F; one of the pipes E, F, being in communication with the upper part of the cylinder 6, *above the piston thereof*, and the other, with the lower part of such cylinder, (see fig. 6,) where the dotted lines marked with the figures 6, 7, 8, and 9, represent the position of the cylinder, the circle of the crank pin, the piston rod of the working piston, and the connecting rod, through which parts the motion given to the working piston, may be transmitted. *y*, *y*, (see fig. 5,) is the apparatus of thin plates, attached to the under sides of the displacing vessel, to assist in cooling the condensing part of the air vessel.

Now, the operation of the engine, (figs. 5, 6, 7, and 8,) will be, in principle, the same as that of the engines, figs. 1, 2, 3, and 4. The continued reciprocating motion of the piston, of the working cylinder 6, depending on the alternate raising of one of the displacing vessels, (see fig. 6,) while the other descends; by which alternate rising and falling, the air space 3, of each air vessel, will be alternately occupied by heated air, in a state of expansion; and cold air, in a state of contraction; and thus, alternately, there will be a given pressure on the surface of the fluid, in the

bottom of one of the vessels, (see fig. 6,) while above the column of water, contained in the opposite air vessel, will be found a diminution of pressure, and *vice versa.* The alternate rising and falling of the displacing vessels, is produced, after the machine has been once started by hand, (which is done by means of spanners 8, fixed on the pins 9, at the end of the levers *n*,) by the rotation of the shaft 4, causing the two cams *o*, *p*, to act through their respective arms *q*, and *m*, chains *l*, rods *i*, and bent arms *h*.

And note, there are springs at 12, (see fig. 6,) for catch-pins, on the lever *m*, to strike against, if the motion of the engine should be too violent, from too great a pressure of air or otherwise.

The prominences and circular portions of the cams *o*, *p*, must be, of course, set out with reference to the extent of expansion of air or gas, with which the engine is intended to work; keeping in view, also, in setting out such cams, that each displacing vessel should, in its turn, rise rapidly, and should then remain stationary, until the other displacing vessel has descended to the bottom of its course; or, in other words, till the working piston has nearly finished its stroke; and should then have its motion reversed, a little before the piston commences the return stroke.

The object of bending down the arms *h*, into the cisterns c, c, and suspending the displacing vessels by the rod *i*, passing up again, through stuffing-boxes, (as shewn in fig. 5,) particularly, is to take advantage, whenever air or gas, of a pressure above that of the atmosphere, is used to work the engine, of the difference of pressure on the rods *i*, within the cisterns, (which, being in connection with the air vessels, will have the same internal pressure as the air vessels,) and on the same rods, where they are exposed merely to the atmospheric pressure. By giving a sufficient sectional area to the said rods, they may be made to balance, either

entirely or as nearly, as may be desired, the weight of the displacing vessels, and, by the same means, the rods *i*, *i*, may be made to perform the office of safety valves, by stopping the descent of the displacing vessels, and thus preventing the air from becoming heated and expended, whenever the maximum of pressure for which the engine is intended, has been exceeded; when intended to have this effect.

The diameters of the rods *i*, will be made such, that the pressure upon them, in the ordinary working of the engine, will not quite balance the displacing vessels; but, that whenever the prescribed limits of pressure, for which the engine is calculated, are exceeded in the cisterns C, the rods *i*, will be pressed upwards with a force, such as to keep the displacing vessels suspended, and thus prevent the body of cold air from being transferred to the heating part of the air vessel.

In figures 9, and 10, I have represented another mode of constructing an engine, according to the said improvement. I have only shewn one of the air vessels and displacing vessels, but the engine is intended to be double. It will not be necessary to do more than describe the parts composing this form of the engine, as its operation will be just the same as that of the engine last described. *a*, *a*, *b*, *b*, form the air vessel; the conical vessel *a*, turning back into the cylinder *b*, *b*, to which it is fixed. The cylinder *b*, *b*, is cast with an enlarged part at the lower end, (see fig. 9,) to allow of the lifting stems *i*, *i*, of the displacing vessel, to work in it, through stuffing-boxes at 2, 2.

The displacing vessel D, is composed of the cylinder D, and conical vessel *d*, both made of thin plate, and the space between them filled with some non-conducting substance. The displacing vessel is represented as about half raised; 3, 3, is the space occupied by the air when heated; and 4, is the space occupied by the air when cooled and contracted.

5, is the water, communicating the force, arising from the alternate dilation and contraction of the air, through the pipe L, to the working piston of a cylindrical barrel, such as already referred to in describing the preceding engines, and not shewn in the drawing. F, is the fire-grate, attached to the tube *f*; the whole enclosed in a conical tube *p*, so that it can be taken out bodily.

The external air enters into the ash-pit *g*, through the tube *f*,—passes up through the grate-bars *h*, and thence to be distributed through the spaces *l*, *l*, corresponding to the flues; and through the pipes *m*, which, after conveying the heated air all round, the jacket *n*, of the air vessel, conveys it away, into the chimney by the pipe *o*. *q*, is the hinge-door of the ash-pit, to clear it out, when the furnace is re-removed.

The motion of the displacing vessels D, *d*, in order to transfer the body of air alternately from the hot to the cold medium, and *vice versa*, will be produced by cams, connected with such displacing vessels, and set in motion from the main axis of the engine; and by mechanism, similar in its arrangement to that already described, in reference to the engines previously described for the like purpose. 6, is a plate filled with small holes, like a colander, for the purpose of taking up and retaining, for a few instants, the water contained in the lower part of the condensing chamber at 5, when the displacing vessel, having descended therein, is being raised again. This is instead of the apparatus of circular plates, described in reference to the figures from 1 to 8, in order to assist in keeping the condensing part of the vessel cool. The said condensing part of the air vessel may be kept cool either by surrounding it with a cistern of water, in the manner described in reference to he figs. 1 to 4; or, by connecting it with some other vessel, so kept cool.

Fig. 11, represents a fourth mode of constructing an engine, according to the said improvements. It is intended to be double, like the engines already described, but I have only shewn one of the air vessels and displacing vessels in the drawing. In the construction, the position of the parts are reversed; viz., the heating chamber is at the bottom of the air vessel, and the condensing chamber at the top thereof. *a, a, a, a,* is the air vessel, and D, *d,* the displacing vessel; the latter is suspended by a rod 2, (made hollow for lightness,) and a chain 3, from the arch head of the beam 4, the opposite end of which carries a counterweight 5. To the bottom of the stem 2, is fastened, by a screw and washer, a cup-leather 6, the edges of which are turned up, (see the fig.) in order to prevent any of the water, which communicates the force of the engine to the working piston, (not shewn in the drawing,) from passing down into the hot end of the air vessel.

F, is the furnace and fire-grate; the heated air therefrom passes up into the conical vessel 7, in the interior of the mouth of the air vessel, and thence down by the surface of the cone *a,* of the air vessel, whence it passes up into the jacket 8, and thereout into the chimney 9. The water which transmits the force of the engine, through the medium of the working piston, communicates from the air vessel, (shewn in fig. 11,) through a pipe 10, to one side of the working piston; while the water in the corresponding air vessel, not shewn in the drawing, is, by another corresponding pipe, placed in communication with the other side of such working piston.

When the displacing vessel, D, *d,* in fig. 11, descends, while the displacing vessel of the corresponding part of the engine, (not shewn in the drawing,) ascends, the hot air contained in the heating part of the air chamber at 12, passes out thereof through the bent pipe 13, and ascending

through the pipe 14, and the bent pipe 15, passes by the edges of the ball 16, and descending into the upper end or condensing chamber of the air vessel, becomes there contracted; consequently the air vessel, (fig. 11,) will be then full of air, in a state of contraction; while the air, in the other air vessel of the engine, will, by the opposite effect of its displacing vessel, have become heated into a state of dilation. There will, therefore, be diminution of pressure on the surface of the communicating fluid, in the vessel *a, a*, and pipe 10, fig. 11, while there will be increase of pressure on the surface of such fluid, in the other air vessel of the engine; and, consequently, the working piston will be set in motion. The action is just the same as in the engine already mentioned, and need not be further described.

The weight of the displacing vessel will be balanced, by means of the difference of pressure on the rod 2, within and without of the air vessel, by duly proportioning its sectional area with reference to the *mean pressure* of the air or gas used, on the principle pointed out in reference to engines, figs. 5 to 10.

The ball 16, is of such weight that the air or gas in passing by does not displace it, but it will prevent the water communicating the force of the engine from passing by it into the pipe 14, by closing (if the water presses against it) the aperture of the passage, see fig. 11. The pipe 14, is filled with concentric tubes, or else with coils of very thin metal, so as to allow free passage to the air, from one end of the air cylinder to the other; and, at the same time, to offer a large surface to take up the heat of the air, as it passes between the heated and the condensing part of the air vessels.

In the several engines, hereinbefore described, the air spaces and the temperatures have been supposed to be (as more particularly mentioned in reference to figs. 1, to 4,)

such, that the difference of space occupied by the air, in its utmost state of dilation and in its contracted state, shall be just equal to the volume of water or other fluid displaced at each stroke of the piston; but it will be sometimes desirable so to proportion the air-space, and to regulate the heat applied to work the engine, that, at the end of each stroke of the piston, there shall be a certain amount of pressure of air, not expended in the air cylinder, corresponding to such stroke. In order not to waste such superabundance of pressure, I establish a communication between parts of the two air vessels, of any of the construction which I have described, by means of a pipe furnished with a cock or valve, which (by suitable mechanism wrought by the engine) will be opened, a little before the change of motion of the displacing vessels respectively, so as to allow the superabundance of heated air to pass from the air vessel, in which it exists, into the other one, where it will be rendered available towards producing the next stroke. I have not thought it necessary to delineate on the drawings such pipe of communication, and mechanism for opening and shutting its cock or valve, as the mode of applying the same will be sufficiently understood by the foregoing description thereof.

I have now described several modes of constructing engines to be worked with air or gas, according to the said improvement, and it remains to state a few general observations, applicable to all such constructions, and any other modifications of their forms, which may be adopted by the engineer constructing the same. Firstly,—as regards the air or gas to be employed, common atmospheric air or any known gas of such a nature as to expand considerably by heat, and not to assume the liquid form under such pressures as may be used in engines, constructed according to the said improvements, may be employed; and the same

may be used either at a pressure not exceeding that of the atmosphere, or at a pressure of several atmospheres, in which case suitable forcing pumps, for forcing the air or gas into the engine, in a state of compression, will be connected with the air or gas vessels.

As regards the proper motions to be given to the displacing vessels, the cams or other mechanism which may be devised by the constructor, to cause the same to rise and fall, should be so set out as to raise the displacers as rapidly as may be without producing a shock, and then to leave them stationary, until the working piston has nearly finished its stroke; and, as to the fluid to be employed to transmit the force of the engine, the same may be water, or oil, or any other fluid having sufficient fluidity, and the same or nearly the same degree of incompressibility as water; and it is obvious that various constructions of the mechanical parts, used to transmit the motion of the fluid to actuate machinery, may be employed.

Having now described the said improvements in engines, to be worked by air or other gases, and the manner of carrying the same into effect,—I do hereby declare, that, under the letters patent hereinbefore in part recited, I claim, as constituting the first part of the said improvement, the combination of air or gas vessels and displacing vessels, having such properties as I have described, with mechanism or apparatus in which water, or other such fluid, as aforesaid, is the medium for transmitting the forcible motion arising from the difference between the pressure of the heated air and that of the cold air; but I do not claim any of the parts of the said combination in their separate and distinct character.

I claim, as constituting a further part of the said improvements, the method which I have described of connect-

ing the air vessels by a passage, to be opened at suitable intervals, as I have explained, so as to transfer the unexpended pressure of air or gas which may exist in one of such air vessels into the other of such vessels. I claim, further, as applied to engines, operating by means of air or gas, vessels and displacing vessels, the method of which I have described, of applying intermediate metallic surfaces, in the space through which the air passes backwards and forwards, between the heating and the condensing ends of the air vessels.

And I claim, lastly, the mode of suspending and balancing the displacing vessels, (described in reference to all the figs. 1 to 11,) so as to expose one end of the rod, by which such vessels are suspended, to the same pressure as the interior of the air vessel, while the other end bears only the pressure of the external air, for the purpose hereinbefore mentioned.—[*Inrolled in the Rolls Chapel Office, July,* 1839.]

Specification translated and settled by Mr. Drewry.

To DAVID FISHER, *of Wolverhampton, in the county of Stafford, mechanic, for his invention of an improvement in steam-engines.*—[Sealed 17th May, 1836.]

THIS invention consists in the working of two separate steam-engines, by means of one sliding or other valve.— The patentee describes his invention in the following words, and without reference to any illustrative drawings;—

I place the two cylinders of the said steam-engines, so that the bottom of one cylinder may be parallel to the bottom of the other cylinder; and so that the axis or pis-

ton of one cylinder may be in the same straight line as the axis or piston of the other cylinder; and so that the aperture for admitting the steam into the bottom or lower part of one cylinder, may be directly opposite to the aperture for admitting the steam into the bottom or lower part of the other cylinder; whereby a line drawn from the centre of one of such apertures to the centre of the other of such apertures, will be parallel to the axis or piston of the cylinders. The distance between the outer surfaces of the bottoms of the cylinders, is about equal to the sum of the diameter of the apertures for the admission of the steam into the bottoms or lower parts of the cylinders; but the precise distance is immaterial.

I admit the steam from the boiler or boilers by means of a pipe, into a nozzle or oblong steam-box, the bottom whereof is fitted with three apertures,—two for the passage of steam into the cylinders, and one for the waste steam; and on the bottom whereof is worked, by means of an excentric, a valve, in the same manner as is usually the case in ordinary steam-engines; but each aperture must be sufficiently large to allow sufficient steam to pass for working the two pistons; and the central aperture thereof is the one I prefer to be connected with the waste pipe for the exit of the steam, in the usual way; and one of the said last-mentioned apertures, which I prefer not to be the central aperture, communicates with a pipe, one end whereof is fitted into the upper part of one of the said cylinders, and the other end whereof is fitted into the upper part of the other of the said cylinders; so that when such aperture is uncovered, the steam passes from the boiler or boilers through the said pipe, and into the apertures at the upper parts of both cylinders, at the same time to the upper part of both the said pistons, and forces down both the said pistons at

the same time. The other of the said apertures in the nozzle or steam-box, which I also prefer not to be the central aperture, is in like manner connected, and communicates with the apertures for the admission of steam into the lower parts or bottoms of the said cylinders; and in like manner the steam passes into the lower parts of both the said cylinders, at the same time to the lower parts of both the said pistons, and forces up both the said pistons at the same time.

The steam from the boiler is alternately admitted into and excluded from each of the said end apertures in the said nozzle or steam-box, by the motion of the valve, in the usual way; and the steam from the cylinders makes its exit through the waste pipe, which I prefer to be connected with the central aperture, in the usual way, and may be permitted to escape, when the invention is to be applied to high-pressure engines only; or may be conducted into a condenser, when the invention is to be applied to condensing engines, in the usual way with condensing engines.

Having, as hereinbefore described, generated one uniform motion of the two pistons, such motion may be applied in any of the usual modes, as may be most convenient. When I wish to communicate the motion from both engines to one main shaft, I generally fix, in the same plane, a similar and similarly sized cross-head, perpendicularly to each of the piston-rods; to one, and to the corresponding end of each of the said cross-heads, I attach a similar and similarly sized connecting-rod or arm, which works a crank, in the usual way; and to the other end of each of such cross-heads, I attach another similar and similarly sized connecting-rod or arm, which being fixed to the outer rim or edge of a cogged wheel, whose radius is equal to the radius of the crank-arm which works such cogged wheel, and turns

the same round in the same time as the other arm completes a revolution of the crank. The two wheels, turned round by the action of the said two pistons, are similarly cogged, and of equal size, and in the same plane, and between the same and in the same place; and with its centre, in the same straight line, is placed another similarly cogged wheel, between the said two wheels; the action of each of the two outer cogged wheels tends to turn round the central cogged wheel in the same direction;—the axis of this wheel forms the main shaft, whereon works the fly-wheel.

It is not essential that the cylinders should be placed in the position hereinbefore described, but that is the position which I usually adopt; and, if convenient, the nature of the communication between the pipes, connected with the end apertures of the nozzle or steam-box, may be varied; and the pipe, connected with one of such end apertures of the said nozzle or steam-box, and admitting the steam into the top of one of the said cylinders, may communicate with the pipe connected with the bottom of the other of the said cylinders, instead of with the pipe connected with the top thereof; and the pipe, connected with the other end aperture of the said nozzle or steam-box, and admitting the steam into the bottom or lower part of one cylinder, may, in like manner, communicate with the pipe connected with the top or upper part of the other cylinder; and, in such case, one of such pistons will be moving upwards, and the other of such pistons, at the same time, will be moving downwards; and the motion from such pistons may be applied by any of the usual mechanical modes, or the position of the waste-pipe may be varied.

Now, whereas I do not claim the use of the hereinbefore-mentioned cross-bar, cranks, or wheels, or any of them;

but I do claim, as my invention, the following improvement, that is to say:—The working of two separate steam-engines by one sliding or other valve.—[*Inrolled in the Petty Bag Office, November,* 1836.]

To Thomas Fisher Salter, *of Great Hallingbury, in the county of Essex, farmer, for his improved machine for winnowing and dressing corn and other grain.*—[Sealed March 23rd, 1839.]

This invention is an improved winnowing machine, in which the several operations of blowing, screening, sifting, &c., may be performed together or separately.

Under the bottom of the hopper of the machine, is placed one end of a cylindrical sieve, made of wire or other suitable material, and to the other end of this sieve is attached a semi-cylindrical metal hopper. They are placed in inclined positions, extending from one side of the machine to the other, and are separated from one another by a sliding door or shutter, by means of which the size of the orifice, for the admission of corn into the semi-cylindrical hopper, from the sieve, can be adjusted, thereby allowing the corn to remain in the sieve a longer or shorter time, according as the orifice is enlarged or diminished.

The semi-cylindrical metal hopper is provided with a large opening or slot in the lower part of it, through which the grain falls, and this opening may be increased or lessened, by means of a sliding shutter arm and screw nut.

In the cylindrical sieve and hoppers, a shaft revolves, having attached to that part of it which turns in the large or upper hopper, three arms or beaters, for the purpose of stirring-up the corn or grain, and expediting its passage into the cylindrical sieve; that part of the shaft which re-

volves within the cylindrical sieve and lower hopper, is also provided with a number of arms or beaters, placed at short distances from each other, and in positions coiling like the thread of a screw round the shaft.

Below the semi-cylindrical metal hopper, is a box or framing containing sieves of different degrees of fineness or coarseness, which may be slidden in and out of grooves, in order to change them when required, and to the sieve-frame a lateral reciprocating motion is given. It is supported at about one-third of its length from one end by rods, which pass through each side of the machine, and act as pivots, upon which the sieve-frame turns. The other end of the sieve-frame, preponderating by its superior weight, is supported by chains, which are fastened to semicircular pulleys, fixed on a shaft in the upper part of the machine.

The end of this shaft is provided with a ratchet sector and pall, by means of which the sieve-frame can be adjusted to any inclination, the handle of the ratchet wheel shewing, by an index outside, the degree of inclination of the sieve-frame.

Beneath the sieve-frame is a small hopper, which conducts the corn on to a screen, supported by rods at one end, and by chains at the other, in the same manner as the sieve-frame, being adjusted to any inclination by the same means; and to this screen likewise a lateral reciprocating motion is given.

The grain is first poured into the large hopper, at top, in the ordinary way; from thence it proceeds into the cylindrical sieve, where it is thoroughly agitated, all the dirt, &c., passing through the sieve into the space beneath it, and if the grain is barley, the beards are broken off; it is then urged on by means of the spiral direction of the beaters, into the semi-cylindrical metal hopper below, where it is still further agitated, and then it drops through the

opening in the bottom of the hopper, on to the flat sieves, in passing through which it is acted upon by the wind from the fan, which blows upwards through the sieves, in a slanting direction; from the sieves the grain is conducted by a small hopper on to the screen, where it undergoes the screening process, and then falls into any suitable receptacle provided for it.

All the above operations may be performed separately, by disconnecting any of the parts, so that if it is desired to sift the grain only, the fan and screen may be disconnected, and the sieve-frame alone put into action; if screening only is required, the sieves may be removed from the sieve-frame; and if blowing and sifting only are required, the screen may be disconnected, and the fan and sieves used.

The patentee claims as his invention, the improved machine for winnowing or dressing corn, or other grain, hereinbefore described. Also the cylindrical sieve, and the shaft, with its screw coil of agitators or arms, turning therein, in whatever way they may be used in the dressing of corn or other grain, whether in combination with the other parts of the improved machine, or some, or one of them, or otherwise.—[*Inrolled in the Inrolment Office, September,* 1839.]

To ROBERT HERVEY, *of Manchester, in the county of Lancaster, Drysalter, for his invention of certain improvements in the mode of preparing and purifying alum, alumina, aluminous mordants, and other aluminous combinations and solutions; and the application of such improvements to the purposes of manufacture.*—[Sealed 13th December, 1839.]

THESE improvements consist in the following processes:—In the first place the patentee takes clay, selecting such as

contains the smallest quantity of iron, and which will yield the largest quantity of alumina. This clay is then dried, and afterwards ground and passed through a fine sieve. In this state it is put into a reverberatory furnace, and then calcined to a moderate red heat; it is then drawn out of the furnace and allowed to cool; after this it is put into leaden cisterns, and oil of vitriol, (sulphuric acid,) diluted to the strength of from 70° to 80° of Twaddell's Hydrometer, is added to the extent of from one-half to the entire weight of the clay used, according to the quality of the clay employed.

The oil of vitriol and clay are then to be well stirred and mixed together, when a great ebullition or boiling ensues; after this has subsided, the mixture is again to be well stirred, and water, cold or hot, is then gradually added to extract or separate the sulphate of alumina thus formed. The mixture is then allowed to settle for about forty-eight hours, when the undissolved portion of the clay falls to the bottom, leaving sulphate of alumina above. The sulphate of alumina is then drawn off into another leaden cistern, and the clay again lixiviated with water, to extract any remaining sulphate of alumina; which, after settling about twenty-four hours, is drawn off into another cistern, and employed, instead of water only, in lixiviating a fresh quantity of clay and oil of vitriol.

The sulphate of alumina thus formed, as described, (according to a process long known and practised in this country,) is always impregnated with a considerable portion of iron; to get rid of which, I employ two methods:—In the first place, I add to the sulphate of alumina a quantity of prussiate of soda or prussiate of lime, or any other combination of the prussic or ferro-prussic acid, sufficient to precipitate all the iron held in solution in the sulphate of alumina; the supernatant sulphate of alumina, thus puri-

fied, is then drawn off, and in this state is fit for the purposes of the arts.

If, however, it is desired to convert the sulphate of alumina into *alum*, (so commonly called or known,) then add thereto potash, or sulphate of potash, or other of its combinations, the potash in which shall be equal, or nearly so, to the quantity of alumina contained in the sulphate of alumina to be so converted into alum; or add an equivalent quantity of ammonia, or sulphate of ammonia, or other of its combinations. Soda may also be used, but alum is difficult of formation therewith. The liquor thus containing the constituents of alumina is then evaporated by boiling, till it attains the strength of about 70° of Twaddell's hydrometer; it is then run off into leaden or other cisterns to crystallize.

After cooling, the mother-liquor is drawn off, and the alum salt formed is removed from the sides and bottoms of the cisterns, and dissolved in as small a portion of boiling water as possible. The solution is then run into large casks, called "rocking" casks; which, after the lapse of ten to fourteen days, are taken to pieces, and the alum thus formed is broken up and is ready for the market. For the purposes of the arts, however, the presence of an alkali is generally injurious, and is only employed, because without it the alum of commerce cannot be formed but for the purposes of the printer, dyer, or mordant maker;—the sulphate of alumina alone, when freed from iron, is very preferable to alum.

To convert the sulphate of alumina into the aluminous mordant, known in commerce by the name of "red liquor," which is an acetate of alumina, add either a quantity of acetate of lime or lead, in sufficient quantity for the lime or lead to unite with and carry down the sulphuric acid of the sulphate of alumina, thus leaving a supernatant acetate

of alumina; or take the sulphate of alumina, and, by the addition of an alkali, or its combinations, such as potash, soda, or ammonia, or an alkaline earth, or its combinations, such as lime or magnesia, saturate or take up all the sulphuric acid, when the alumina, no longer held in solution, participates.

This alumina is then to be re-dissolved in acetic or pyroligneous acid, which converts it into the acetate of alumina or "red liquor" of commerce; or it can be sold in the state of pure alumina, and be dissolved by the printers, or dyers, or others, in acetic or sulphuric acid, according to the purpose for which they wish to employ it. Or, take the sulphate of alumina formed, as before described, from clay and sulphuric acid, but not freed from iron, and add thereto a sufficient quantity of acetate of lead or lime, to unite with the sulphuric acid in the sulphate of alumina, leaving a supernatant acetate of alumina, to which add a sufficient quantity of the prussiate of potash, soda, or lime, or other combination of the prussic or ferra-prussic acid, to unite with and carry down all the iron in the acetate of alumina. After allowing it to settle, the clear liquor must be drawn off, care being taken not to disturb the bottoms or sediment, or precipitate the alumina from the impure sulphate of alumina, and re-dissolve it in acetic or pyroligneous acid, and afterwards precipitate the iron in the manner before described.

Another method by which the patentee frees the sulphate of alumina, prepared as before described, from iron, is as follows:—To the sulphate of alumina so formed, add, as before described, an alkali or alkaline earth, combined or otherwise, for the purpose of precipitating the alumina.

As, however, in this way, the iron also precipitates along with the alumina, it is proper to re-dissolve the alumina in caustic alkali, such as potash or soda, which will dissolve

the alumina, and only a very small portion, if any, of the iron; then draw off the clear liquor, taking care not to disturb the bottoms or sediment, and to this liquor add sulphuric acid, or acetic, or pyroligneous, or some other acid, to neutralize the alkali, which holds the alumina in solution, when the alumina precipitates, and may be sold either in that state, or converted into sulphate of alumina for sale, or otherwise, or into acetate of alumina, or into the alum of commerce, by the addition of sulphuric acid and potash, or ammonia.

Having now described the particulars of these improvements, and the method of carrying the same into practical effect, the patentee says, I desire it to be particularly understood, that I claim, as my invention, the method I have described, for preparing and purifying alum, alumina, and other aluminous solutions, and combinations, and also for manufacturing aluminous mordants, from sulphate of alumina, and alumina, instead of from the alum of commerce, in the manner and for the purposes herein set forth.—[*Inrolled in the Rolls Chapel Office, June,* 1840.]

To George Eugene Magnus, *of Manchester, in the county of Lancaster, merchant, for his invention of certain improvements in manufacturing, polishing, and finishing slate, and in the application of the same to domestic and other useful purposes.*—[Sealed 8th February, 1840.]

These improvements in manufacturing, polishing, and finishing slate, and in the application of the same to domestic and other useful purposes, consist, firstly,—in manufacturing, shaping, or forming certain articles of slate,

instead of employing metals, marbles, wood, and other substances, of which such well-known articles are commonly made, and have for their principal object durability, economy, and beauty of appearance, when compared with similar articles of the ordinary manufacture at present in use.

The articles which I have manufactured of slate, instead of other materials, as generally employed, and which I claim as new, and never before made, used, or known, and to the sole manufacture of which I consider myself entitled, under the above, in part recited letters patent, are baths composed solely of slate, and shaped, formed, or adapted to the reception of the human figure, by being carved out, or otherwise formed to the shape,—billiard tables composed solely of slate, that is, the frames and legs, as well as the bed or table, although I am aware the bed or table has been heretofore made of slate, which I do not claim, excepting when combined with the framing and legs—mangles, the bed and chest of which are to be composed of slate, and also weighted with slate; as before, I am aware that mangles have been made with the beds only of slate, but I claim the combination of the bed and chest when composed of slate—corn chests, made entirely from slate, and fitted with covers, sliding upon small rollers—taps, for liquids, composed of slate, by being carved out and fitted with metallic plugs, covered with slate, and which are thus entirely protected from filth or frost.

Secondly,—my improvements consist in polishing and finishing such manufactured articles of slate, as are required to be used for ornamental purposes, by the following process, which will be found to render slate surfaces as beautiful as the highest polished marbles:—take seven pounds of linseed oil, one pound of umber, ground, three pounds of spirits of tar, and one pound of asphaltum, well mixed together. This mixture is then to be placed upon the

slate surface with a brush, and submitted to a heat of two hundred degrees, or rather more; and, after being allowed to cool, it is to be polished with pumice and rotten-stone, by hand, and then painted or ornamented with any suitable device or pattern, in any variety the taste of the operator may suggest, after the manner of the papier machée manufacture.

Having thus described my improvements in manufacturing, polishing, and finishing slate, and the particular application of the same, I desire it to be understood, that I claim particularly, the manufacture of the above-mentioned several articles, when composed of slate, being, to the best of my knowledge, of my invention, and not heretofore known.—[*Inrolled in the Rolls Chapel Office, August,* 1840.]

To John Louis Bachelard, *of Saint Martin's-lane, in the county of Middlesex, gentleman, for improvements in the manufacture of beds, mattrasses, chairs, sofas, cushions, pads, and other articles of a similar nature, being a communication from a foreigner residing abroad.*—[Sealed July 30th, 1840.]

This invention consists in stuffing mattrasses, seats, couches, beds, &c., with cork, reduced to small pieces, which may be done by sawing or breaking it into either fine or coarse dust, or else cutting into long narrow slips.

The patentee prefers using the refuse pieces, made by cork cutters, not only for economy, but because he considers it desirable to have the fibres cut from curved pieces, such as the parings of bungs, &c., as they contain more elasticity.

Horse-hair may also be used, in combination with the cork, with very good effect.

The patentee claims the use of cork, when cut into fine fibres, or reduced to dust, for stuffing mattrasses, couches, chairs, &c., but not for "fenders" used to protect the sides of ships, as it has been before applied for that purpose.—[*Inrolled in the Inrolment Office, January,* 1841.]

To JAMES WALTON, *of Sowerby-bridge, Halifax, in the county of York, cloth dresser and frizer, for improvements in the manufacture of beds, mattrasses, pillows, cushions, pads, and other articles of a similar nature, and in materials for packing.*—[Sealed May 12th, 1840.]

THIS invention is described under three heads: the first—is the combination of elastic globular air vessels; second—the packing articles of a fragile nature with such elastic air vessels, and third—stuffing beds, pillows, &c., with the same.

The machinery used by the patentee for manufacturing these air vessels, which are balls or globes made of Indian rubber, is shewn in the specification; but, as it greatly resembles the apparatus now used for making children's footballs, it may here be dispensed with. These balls are lined with cotton to prevent them from collapsing, if burst; and several of the balls are connected together, as the patentee describes it, in sheets, which constitutes the combination, or the balls may be used separately for elastic resistance.

The patentee states, these elastic balls may be employed with advantage, in packing fragile articles, such as plate-glass, vases, china, or other articles, which are now usually

packed in shavings or straw. Single balls should be used for these purposes, but if an article liable to injury from damp is to be packed, the sheet balls are preferred, as the ends of the sheet may be cemented together, with dissolved Indian rubber, and thus the packing becomes impervious to water.

When used for stuffing beds, the sheets of Indian rubber balls or globes are placed in layers, one upon another, until they make the thickness required; they are then sewn in a covering, and form a soft and elastic mattrass or cushion.—[*Inrolled in the Inrolment Office, November,* 1840.]

Scientific Notices.

ON THE NATURE AND PROPERTIES OF SULPHUR.

We extract the following highly interesting article on the nature and properties of sulphur, from the Mining Journal, an able and well-conducted weekly newspaper, forming a complete register of mining and railway intelligence, and frequently containing articles of considerable interest to the general reader.

Owing to the recent dispute between the British and Neapolitan Governments, respecting the sulphur monopoly, the attention of many of our chemists and mining engineers has been directed to the subject, with the view of ascertaining the best method of extracting sulphur from ore, found within the United Kingdom. Any information, therefore, connected with the nature of the mineral, and the most advantageous manner of employing it in the arts, cannot fail of being a subject of interest to all those who can appreciate the national value of mineral wealth, as well as a great source of riches to those who successfully employ such information.

In the first place, a short sketch of the statistics of sulphur, or brimstone, with an account of its nature and combinations, may be useful. It is most abundant in nature, being found in all formations, from the oldest to the newest; but it abounds chiefly in volcanic districts, where it is often found in a native state; it is largely combined with metals in their mineral state, in the form of sulphurets. Copper, iron, antimony, zinc, and lead, are almost always combined with it to a greater or less degree, and it is one of the most important operations in metallurgy to expel sulphur from the ores.

Hitherto the sulphur consumed in Great Britain, amounting annually to about 30,000 tons, has been obtained from Sicily, where it is prepared in a manner hereafter described. It is found in mechanical mixture with earth, both at Solfatara, in Sicily, and Poland. Letters have lately been received from Tripoli, giving an account of an attempt made to work the sulphur mines in the Gulph of Syrte, which promise to be very productive. In Sweden, Saxony, and Bohemia, it is found in chemical combination with iron and copper. This mineral is known by the name of "mundic," also "pyrites," from the Greek word, signifying *fire*, on account of its peculiarity in emitting sparks when struck with any hard substance; it has been used as a substitute for gun flints. The mines of Cornwall, Anglesea, and Wicklow, yield this mineral in great abundance, but sulphur has never been extracted from it in this country, except at the Pary's Mine, in Anglesea, where a small quantity is saved, but by a most extravagant process.

It will be interesting to mention a few of the peculiarities of sulphur, as the phenomena it presents, when heated, offer a striking contrast to the received theories of the tempering of steel and glass, and are analogous to those exhibited by Brony. At a temperature of 110°, sulphur is very fluid, and of a bright citron colour; it preserves these characters up to 140°: but when once it passes this temperature, the phenomena it presents are most curious; for example, at 160° it commences to thicken, and has a reddish tinge, and, if the heat is continued, it acquires a con-

sistency, such that you may overturn the vessel which contains it without displacing the sulphur; betweeen 220° and 250° this change is most remarkable; towards the boiling point it again becomes liquid, but does not lose the colour given it by the heat, nor does it become so liquid as it was at 109°. When raised to a high temperature, and suddenly cooled, sulphur becomes soft; and if the experiment be well conducted on sulphur raised to a temperature of 230°, it will become so soft and ductile that it can be drawn into wires several feet in length.

ON THE USES TO WHICH SULPHUR IS EMPLOYED.

Soft sulphur can be employed with success in the arts, for taking delicate impressions and casts, such as of coins, medals, and seals, or of designs in relief; for in a few days it resumes its premature kindness, and these impressions serve as a matrix for forming other casts. Melted sulphur is also used for the purposes alternately with plaster, as the sulphur contracts in solidifying, while the plaster swells—thus the alterations in the one body are corrected by the other, preserving a proper image, which cannot be done when plaster alone is used. Sulphur is employed to cement iron and stone; it forms sulphurous acid, and by this means sulphuric acid—a commodity we shall treat more fully of hereafter; it is used in the manufacture of matches and gunpowder, combined with magnesia, lime, and potash; it is used as a medicine, and with mercury it forms cinnabar or vermillion.

ON THE REFINING OF SULPHUR FROM EARTHY MIXTURES.

When sulphur is found in combination with earthy matter, its purification generally consists of two distillations; the first roughly performed on the spot where it is obtained, with the object of rendering the cost of carriage less expensive; the second is made with more care, near the spot where it is brought to market. At Solfatara the first distillation is executed in a furnace, or gallery, in which are arranged ten or twelve earthen pots, about twenty inches apart, in two ranges—each of these

pots containing about thirty pints. When filled with ore, broken to the size of road metal, the top is luted down, but there is a tube connected with an opening in one of the shoulders of the jar, about two inches in diameter and fourteen inches long, which communicates with a second jar, pierced with a hole at the bottom, from which the sulphur flows into a tub of water, and is then condensed—it is sublimed in the first jar and cooled down in the second. At Marsailles there is a large establishment for the refining of sulphur, conducted by M. Michel, who invented the apparatus; it consists of a cast-iron retort, and a vast chamber, which serves as a conductor,—the retort containing about 1500 or 1600 lbs. of material, and is heated by a furnace, which, however, has no communication with the chamber or the retort; an iron door in front serves to clear and re-charge the retort, the beak of which conducts the fumes of the sulphur to the large chamber, where they are condensed and collected either in a liquid state or as the flowers of sulphur; the temperature of the condenser alone effecting the condition in which it is obtained. Much care is necessary to be observed in this process, as the admixture of a very small portion of air with the fumes in the chamber gives rise to explosions, which are sometimes dangerous, for it often happens that the temperature of the chamber is carried to the height of 150° (sufficiently high to inflame the sulphur); sulphuric acid is then rapidly formed, and in this process much heat is given out, and an explosion always follows; by valves placed at proper places this may be avoided, and the chamber should be freed of its oxygen by burning sulphur or charcoal in it before commencing to operate. Of late years the method which has been adopted, termed "decantation," has greatly removed the difficulty of the process, as explosions are now seldom known to occur. This arrangement consists in placing a large vessel, filled with crude sulphur, above the retort of distillation, and allowing the heat of the chimney to act upon it; a tube is made to wind round this vessel, furnished with valves, to permit the melted sulphur to flow through it and communicate with the bottom of the retort containing the sulphur to

be distilled; this disposition has the advantage of maintaining a more uniform temperature, and rendering the operation more rapid. By the ordinary method the loss amounted to about 18 or 20 per cent., but by M. Michel's modification the loss is reduced to 11 or 12 per cent. Notwithstanding these precautions, the fumes of sulphuric acid which escape when opening the chamber to extract the sulphur or clear it out, frequently destroys all vegetation in the neighbourhood; it is, therefore, important to construct them so that the sulphur can be withdrawn without entering the chamber. Eight or nine charges are usually evaporated before running off the sulphur. It is of great importance to have thermometers inserted in the chamber, at such places as they can be observed, as we have seen that, if the sulphur is above the temperature of 110°, and suddenly cooled, it loses its citron colour, and is not so valuable in the market, although equally pure.

ON THE EXTRACTION OF SULPHUR FROM PYRITES.

Sulphur is also extracted from some metallic sulphurets, and is an important operation in metallurgy; it is more profitably obtained from the persulphuret of iron than from copper ores, and that the process may the more easily be comprehended, it may be said that iron pyrites is combined in such a manner, that if one-half of the sulphur be extracted, the residue will then be constituted in such proportions, that if the sulphur be acidified, and the iron be transformed into the protoxide, then will result the neutral salt of the sulphate of the protoxide of iron; this may be effected by the action of heat; but in Saxony and Bohemia, where sulphur is extracted from pyrites, not more than 25 per cent. of the sulphur contained is obtained, as it is stated that the heat necesssary to disengage the remaining sulphur causes the residue to run into a cinder, and that it is impossible to withdraw it without destroying the apparatus. Under slightly different circumstances, however, I have seen the residuum of some sulphur ore from Wicklow, from which 75 per cent. of the sulphur had been extracted at chemical works in Glasgow, which

was not so much run as to have rendered it impossible to withdraw it from the apparatus used in the above-mentioned places, and which may be described as follows:—Earthen tubes, open at both ends, and slightly conical, are placed across a furnace or gallery, having each a slight inclination of about an inch; in their lower opening is placed a star of earth, which permits the vapours to escape, but retains the ore, which is broken in small pieces, and put into the tube; a lid is luted to the upper end, and another tube is attached to the lower extremity, which serves to conduct the sulphur vapours to a condenser containing water; it is then re-melted and run into moulds, such as we receive it. Each furnace is provided with from twelve to twenty-four tubes, each containing about one-quarter of a cwt., and the distillation lasts about eight hours; in a furnace of twenty-four tubes about 2000 lbs. of sulphur ore are treated in a week, and about 190 lbs. of sulphur are obtained, which is about 14 per cent. M. Dartiques, at his establishment in the neighbourhood of Ramur, has made a slight modification of this apparatus, and obtains the same result.

Sulphur is also extracted from pyrites at Falhun, in Sweden, and Goslar, in the Hartz Mountains; at the former place it is obtained by a process proposed by the celebrated Ghan, and may thus be described:—On the slope of a hillock a pile of pyrites is laid upon billets of wood; the wood is first ignited—the pile is then covered with baked earth or puddle (a small opening only being left at the top to regulate the combustion, and which can be closed by a flagstone)—the vapours are allowed to pass along a conduit, about forty-three feet in length, and formed of boards; the vapours which condense in this passage are taken out of small reservoirs in the form of sulphur, and the uncondensed vapours pass into a large chamber, where they circulate till condensed, which can be assisted by artificial means. This chamber, as well as the conduit, should be perfectly air-tight, otherwise the fumes of sulphur will be converted into sulphurous acid, and, should moisture be present, into sulphuric acid, by deriving oxygen from the atmosphere; the sulphur in general, obtained by this process,

does contain so much sulphuric acid, that it is necessary to wash it. By the Goslar process, not more than 1 or 2 per cent. of sulphur is obtained, but this process is instituted chiefly for the roasting of ore and not for obtaining sulphur ; it is also practised at the Pary's Mine, in Anglesea, and may be described as follows :—In the centre of a truncated pyramid a chimney is formed of billets of wood, and, for the purpose of assisting combustion, passages are formed under the pile communicating with this chimney ; the mass is then fired by throwing some ignited charcoal down the funnel, when combustion quickly takes place ; the pyrites, in decomposing, emits a sufficient heat to evaporate the sulphur, which, at certain stages, is ladled out of small holes made in the top of the pile—the operation lasts for about three months. The sulphur thus obtained in Anglesea contains about 7 per cent. of impurities, while that imported from Solfatara contains only 3 per cent., and that not all arsenical.

ON THE NATURE OF THE RESIDUE AFTER EXPELLING PART OF THE SULPHUR.

We have seen that, in Saxony and Bohemia, as well as by the process of M. Dartiques, that only 25 per cent. of the sulphur present in the ore is extracted, which circumstance would indicate that the residue is a combination of determinate proportions of such a nature, that the persulphuret being formed of two atoms of sulphur and one of iron, this residue will consist of two atoms of iron and three of sulphur; or that it will correspond to the sulphuret of the red oxide of iron, from which can be formed the neutral sulphate of the peroxide of iron; by exposure this salt becomes the sulphate of the protoxide of iron, which, in combination with the necessary quantity of water for crystallization, forms copperas. Sulphuric acid is the most important of the combinations of sulphur, and a sketch of some of its properties and formation may now be given the more fully, to explain the process by which it is obtained from iron pyrites, which is now so generally coming into use, to the great benefit of so many of our mining districts, but chiefly to the mines of the county Wicklow.

Sulphuric acid is known to us in three distinct forms—first, pure or dry acid; second, combined with water, or what is usually termed, the sulphuric acid of commerce; third, in the state called glacial, or fuming, which is a mixture of pure and hydrate acid in variable proportions. Dry sulphuric acid is solid at the ordinary temperatures—liquefies at 25 deg., and instantly goes off in vapour; when crystallized it is with difficulty redissolved; its crystals are of the form of needles and stars, of a clear transparent white colour; when liquid, its density is 1·97 to 2·00—solid, it would be something more. Ordinary sulphuric acid, or hydrate acid, is an oily liquid, but not so heavy as the anhydrous acid; its density at 15 deg. is only 1·848; neither is it so caustic, although sufficiently so to decompose with rapidity either animal or vegetable material. While the anhydrous acid boils at 25 deg., the hydrous only boils at 310 deg.; the anhydrous congeals at temperatures below 25 deg., while the hydrous only solidifies at 10 or 12 deg. below Zero, of the centigrade scale; it does not fume in the air, but it rapidly extracts moisture from the atmosphere, and will imbibe four times its own weight of water if exposed for a sufficient length of time, and frequently agitated. When mixed with water in certain proportions, it gives out various degrees of heat, and great cold is produced by mixing it with ice.

The discovery of sulphuric acid is due to Basile Valentine, a chemist, who lived towards the end of the fifteenth century, but it has since occupied the attention of all who have devoted themselves to chemistry. Mons. C. Desormes has explained the theory of the formation of this acid, as follows:—Having first exhausted a glass globe, he passed into it two measures of sulphurous acid and half a measure of dutoxide of nitrogen (these gases mix without uniting), two measures of oxygen were then introduced into the balloon, when immediately red vapours, due to the formation of nitrous acid, appeared, caused by the combination of the dutoxide with the oxygen added; a few drops of water being then introduced, the red vapours disappeared, and

small white crystals began presently to form on the sides of the globe. According to M. Clement Desormes, these crystals are composed of sulphuric acid and dutoxide of nitrogen, united with a certain portion of water. If, at this stage, a greater quantity of water be injected, the crystals will immediately dissolve with a hissing noise, and the temperature will be sensibly raised. The water charges itself with sulphuric acid, and disengages the dutoxide of nitrogen, which, coming in contact with oxygen, returns to the state of nitrous acid, and the red vapours again appear. In this case the water added has determined the separation of the sulphuric acid, and the nitrous acid, which had given one portion of its oxygen for the formation of the crystals, is reduced to the state of the dutoxide of nitrogen, which is disengaged; but this dutoxide of nitrogen again meets with the oxygen and sulphurous acid in the balloon, where again it passes, first into nitrous acid, then into the small crystals before-mentioned; these are in their turn decomposed by the water, and so on until the sulphurous acid or oxygen be entirely consumed. We thus see how a small quantity of nitrous acid can transform an infinite quantity of sulphurous acid into sulphuric acid. M. Gay Lussac has, however, thrown some doubts on the manner in which these elements are said to be in combination; and M. Dumas is disposed to think there are some modifications, under certain circumstances, with which we are not fully acquainted.

ON THE MANUFACTURE OF SULPHURIC ACID.

Sulphuric acid is manufactured on a large scale, by permitting the fumes of sulphur, burned in a separate chamber, or the sulphurous fumes from ignited pyrites, to enter a large leaden chamber, having a few inches of water at the bottom of it, and causing the dutoxide of nitrogen to mix with it there; in some instances, and for the sake of economy, the dutoxide is obtained by decomposing sugar or starch by nitrous acid, thereby obtaining oxalic acid; but, for the most part, the nitrate of potash is placed upon shelves midst the fumes of the sulphur, thereby sup-

plying dutoxide of nitrogen and sulphurous acid in proportions sufficiently economical. The purposes for which sulphuric acid is applied in the arts, are as follows:—In the decomposition of salt for obtaining soda—largely used in making glass, soap, &c., also muriatic acid, which is employed in so many purposes; it is the means of obtaining chlorine, and is used in the fabrication of nitric acid, as well as most of the acids known; it separates silver from gold—is an ingredient in the formation of alum—the sulphate of copper and iron; it is partly the means of bleaching, and is used in the preparation of sugar from beetroot; it is used in dyeing, and for a number of other purposes, as a secondary agent. The facility with which sulphuric acid is manufactured from pyrites, renders the distillation of sulphur a matter of less importance than would at first appear; yet the immense expense of carriage of so much extraneous matter is a subject well worthy of consideration; and having given the analysis of the nature of the residue, after expelling different portions of sulphur, we may recite a few of the useful purposes for which that residue may be employed.

REMARKS ON THE USEFUL EMPLOYMENT OF THE RESIDUE OF DISTILLATION.

We have already seen that when 50 per cent. of the sulphur contained in the persulphuret of iron is expelled, the sulphate of iron, or copperas, may be obtained from what remains. We are, however, told that no more than 25 per cent. of the sulphur of the pyrites can be obtained without injury to the apparatus, and that, in this case, the residue would contain that portion of sulphur corresponding to the sulphate of the peroxide of iron. Now, either of these can be turned to a profitable account. Copperas is an article of commerce in large demand; and both the sulphate of the protoxide and the sulphate of the peroxide are the basis of the fuming sulphuric acid of Nordheusen, which, although not of such general use as the ordinary acid, is yet essential to dyers for forming solutions of some of their dyes, for which the ordinary

acid will not answer. At present there is but one manufactory for the formation of this acid; the internal economy of this establishment is kept secret, but we are well acquainted with the manner of obtaining this acid; the residue in this case is the red oxide of iron, long known by the name of "colcothar," or "crocus of Mars"—a powder used for giving a fine polish to steel; also used by silversmiths under the name of "rouge," and by opticians for polishing the specula of telescopes.

By a systematic arrangement of this kind, every particle of matter in the pyrites may be turned to account, and on the spot where the pyrites is obtained a very perfect process might be established to supply the market with pure sulphur, the value of the residue being sufficient to defray the cost of its extraction—time being the chief agent for converting the residue into the marketable commodities mentioned. The expense of fuel requisite for the distillation of the sulphur may be avoided, by applying to that purpose the heat given out by the combustion of pyrites in the act of forming sulphuric acid, and a great portion of the ore, after having given off one part of its sulphur by distillation, may then be used for the manufacture of sulphuric acid, where it will be still farther reduced. It is quite possible to expel all the sulphur from the iron by roasting, but it involves considerable expense in fuel; at the present time an experiment, on a large scale, is being made, to test the economy of the operation. The formation of sulphuric acid of commerce, at the same period as the fabrication of the fuming acid, would be economical, as the heat given out would distil the dry acid from the salt of the sulphate of the peroxide of iron, at the same moment as it was driving off the sulphur from the pyrites, in order to form both sulphur and the base of the salt mentioned.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from page 126, Vol. XVIII.)

June 23, 1840.

The President in the Chair.

"On the Stamping Engines in Cornwall."

By John Samuel Enys, A. Inst. C. E.

The process of stamping or reducing the ores of tin, in Cornwall, by means of iron stamp-heads, which crush the ore in falling upon it, was formerly effected in mills worked by water power. These have been, from economical and other reasons, for the most part superseded by the use of steam; and even with inferior engines, the result has been such as to enable the poorer portions of the lode (which were frequently left in the mine) to be now advantageously worked.

The work performed by the stamping engines was reported with that of the pumping engines, and showed the duty to be from 16 to 25 million lbs. raised one foot high by one bushel of coal, as estimated from the actual weight of the stamp-heads. The engines appropriated for this purpose were generally old double-acting engines of inferior character, and not unfrequently in a bad state of repair. The use of expansive steam was tried with good effect upon them, and induced Mr. James Sims to build an engine calculated more fully to develope the advantages of this principle. He accordingly, in the year 1835, erected one at the Charlestown mines. It was a single-acting engine, communicating the movement direct to the cam shaft for lifting the stampers without the intervention of wheel-work. The first reported duty, in December, 1835, was 43 millions, which was two-fifths more than had previously been performed by stamping engines. Subsequently, Mr. Sims erected other engines of similar construction, and from them may be taken the reported duty in April, 1840:—

Charlestown Mines . . .	59,589,884 lbs.
Carn Brae	57,611,073 „
Wheal Ketley . . .	58,748,452 „

This increased duty induced other engineers to turn their attention to the subject; and they have constructed engines which equal these duties; the chief variation being the adoption of double action, which seems generally to be preferred.

This paper is accompanied by four drawings of the Carn Brae stamping engine, by Mr. Sims, junior, showing, in great detail, the construction of the engine, and the stamping machinery.

"On the Effects of the Worm on Kyanized Timber, exposed to the Action of Sea Water, and on the use of Greenheart Timber from Demerara, in the same situations."

By J. B. Hartley, M. Inst. C. E.

There are probably few ports in England where the inconvenience resulting from the attacks of marine worms (*Teredo navalis*) on the timber of the dock gates and other works exposed to their action, is more severely felt than at Liverpool. The river Mersey has a vertical rise of tide of 27 feet at spring, and 13 feet at neap tides, and the stream being densely charged with silt, a considerable deposit takes place in the open basins, and to some extent in the docks. The latter are cleansed by means of a dredging machine; but the former are usually "scuttled," for which purpose sewers, connected with the docks, surround the basins, having several openings furnished with "clows," or paddles, so that the rush of water from the docks may be applied for clearing away the mud from any particular part of the basin. The security of these paddles is, therefore, of the greatest importance, as the failure of one of them might, by allowing a dock to be suddenly emptied, cause great damage to the shipping. These paddles have been usually constructed of English oak or elm, and, being much exposed, they suffer from the attacks of the worms. Cast-iron paddles have been tried; but in consequence of the rapidity of the corrosive action, they soon became leaky, and were abandoned. Kyanized oak timber has been tried on the back of these paddles, and found to be perforated by the

worm in the same time as unprepared wood. Some oak planks, two inches and a half thick, Kyanized at the Company's yard, were used on the west entrance gates of the Clarence Half-tide Basin, and in 14 months were completely destroyed. Several similar instances of the non-efficiency of the Kyanized timber are given; and the author proceeds to designate the timber which resists best in such situations. He considers that Teak is less liable to injury than English woods, and instances the inner gates of the Clarence dock, which have been built for 10 years, and at present are but slightly attacked.

The timber which he prefers for dock works is the *Greenheart*. It is imported from Demerara, in logs of 12 to 16 inches square by 25 to 40 feet long, and costs about seven shillings per cubic foot. Of its power to resist the attacks of worms, he gives many proofs,—one of them may be cited:—At the first construction of the Brunswick Half-tide basin, several elm clows were placed at the west entrance; these were destroyed by the worms in two years, and were replaced by others made of Greenheart; the joints of the plank being tongued with deal, to render them completely water-tight. These clows have now been down about seven years, and, although the deal tongueing has been destroyed by the worms, the Greenheart planking remains untouched, and perfectly sound.

Many methods of protecting common timber have been tried; but the only successful ones adduced are—1st, the use of broad-headed metallic nails, driven nearly close to each other into the heads and heels of the gates, but if driven an inch apart, the worm penetrates between them; and, 2dly, steeping the timber in a strong solution of sulphate of copper, from the Parys copper mines in Anglesea. Some paddles made of English elm, thus prepared, had been in use upwards of three years, and, on an examination, were found to be very slightly injured; while the unprepared timber about them was quite destroyed.

The author observes, that the outer gates of the wet basins are most injured by the worm, from the sills being low down, and the change of water every tide assisting the growth of the worm.

Those parts of the gates which are alternately wet and dry, are more injured by the worm than the parts immersed always in the same depth of water. At the spot where a leak occurs from a bad joint, a defect in the caulking, or other cause, the worm commences its attack; so that the most incessant attention is required. Those basins into which the sewers of the town discharge themselves, are comparatively free from the worm, from which it would appear that sulphuretted hydrogen gas acts, in some measure, as a protection against the attacks of the worm.

"An Account of the actual State of the Works at the Thames Tunnel, (June 23, 1840)."

By M. I. Brunel, M. Inst. C. E.

In consequence of local opposition, the works have not advanced much since the month of March, 1840; but, as that has been overcome, and facilities granted by the City, the works will be speedily resumed, and the shaft on the north bank commenced.

The progress of the Tunnel in the last year has been, within one foot, equal to that made in the three preceding years. During those periods collectively, the extent of the Tunnel excavated was 250 ft. 6 in., and during the last year the excavation has been 249 ft. 6 in. This progress has been made in spite of the difficulties caused by the frequent depressions of the bed of the river. These have been so extensive, that in the course of 28 lineal feet of Tunnel, the quantity of ground thrown upon the bed of the river, to make up for the displacement, in the deepest part of the stream, has been *ten times* that of the excavation, although the space of the excavation itself is completely replaced by the brick structure. On one occasion the ground subsided, in the course of a few minutes, to the extent of 13 feet in depth over an area of 30 feet in diameter, without causing any increased influx of water to the works of the Tunnel. The results now recorded confirm Mr. Brunel in his opinion of the efficiency of his original plan, which is "to press equally against the ground

all over the area of the face, whatever may be the nature of the ground through which the excavation is being carried." The sides and top are naturally protected; but the face depends wholly for support upon the poling boards and screws. The displacement of one board by the pressure of the ground might be attended with disastrous consequences; no deviation, therefore, from the safe plan should be permitted.

The paper is accompanied by a plan, showing the progress made at different periods. It is stated that a full and complete record of all the occurrences which have taken place during the progress, has been kept, so as to supply information to enable others to avert many of the difficulties encountered by Mr. Brunel in this bold yet successful undertaking.

June 30, 1840.

HENRY ROBINSON PALMER, V. P., in the Chair.

"Description of an Instrument for describing the Profile of Roads." By Henry Chapman, G. Inst. C. E.

The object of the author in the invention of this instrument was to facilitate the mode of making a preliminary survey for railways by a machine of a simple construction, and composed of very few moving parts. It may be thus briefly described:—

A light frame with springs, and upon four wheels, carries the machinery, to which a rotary movement is communicated from one of the wheels, which is keyed fast upon its axle. A double-threaded screw, and a series of wheel-work, give motion to a cylinder, upon which a length of paper is coiled; this cylinder revolves, and moves simultaneously in the direction of its axis. A pencil, which moves parallel to the axis of the cylinder, marks a line upon it, with a velocity varying according to the inclination of the road, and is so arranged, that when the machine is passing along a level, the motion of the pencil will equal that of the cylinder. In ascending inclined planes, it will be retarded;

and in descending, it will be accelerated. By these means a rising or falling line will be accurately drawn. This variation in the action of the pencil is accomplished by means of a friction-wheel working against a cone, the different diameters of which regulate and determine the speed. The position of the friction-wheel upon the cone is determined by the change of position of a pendulum, vibrating within a case, which is filled with a dense fluid, for the purpose of rendering its action more uniform.

The machine will trace a section of a road in lengths of five miles upon each sheet of paper, to a horizontal scale of 20 chains per mile, and to a vertical scale of 200 feet to an inch. That no inconvenience may be felt from the smallness of the scale, the instrument is furnished with scales with sliding verniers, from which memoranda can be made of the distance run, and of the variations above or below the datum line. These memoranda are made upon a strip of paper, which is fastened on a table, along which an index travels at a velocity corresponding with that of the paper on the cylinder; so that the strip of paper being afterwards laid upon the section, the points marked may be squared down without using the scales.

When the distance of five miles is passed over, a bell gives notice of the working machinery being disengaged; the section is removed; a fresh sheet of paper is introduced, and, as the pencil maintains its position, the section will be carried on continuously.

This communication is accompanied by three working drawings, showing, on a large scale, the machine in action, and all the component parts in great detail.

"On the Efflux of Gaseous Fluids under pressure."

By Charles Hood, F.R.A.S., &c.

The theoretical determination of the velocity with which gaseous fluids are discharged through tubes and apertures, has frequently been investigated by mathematicians; and as the question

is one of importance in various branches of practical science, the author examines the several theorems which have been proposed for its elucidation, and compares them with the results obtained by experimental researches.

Dr. Papin, in 1686, appears to have first ascertained the law of efflux to be the same for both elastic and inelastic fluids, and the majority of the writers on the subject since his time have adopted as the fundamental *data* of their calculations, the hydrodynamic law of spouting fluids, by which the velocity of discharge is found to be proportional to the square root of the height of the superincumbent column of homogeneous fluid.

The author investigates particularly the methods of calculation proposed by Dr. Gregory, Mr. Davies Gilbert, Mr. Sylvester, Mr. Tredgold, and M. Montgolfier, and points out the differences which exist in their several methods. That of Mr. Sylvester is the only one which differs in any considerable degree from the simple law above stated; and his calculation is based upon the supposition that the respective columns of light and heavy air represent two unequal weights suspended by a cord, hanging over a pulley—by which mode of calculation, in the cases selected by the author for comparison, a result is obtained of only about one-third the amount given by the other methods. These calculations are compared with some experiments made by Sir John Guest at the Dowlais Iron Works, and also of Mr. Dufrenoy at the Clyde and at the Butterly Iron Works, recorded by him in his report to the Director-General of Mines in France. The results are tabulated; giving the pressure of the blast, the area of discharge, the velocity of the blast, the quantity of air ascertained by experiment, and the quantity shown by the several methods of calculation. From all these comparisons the author draws the conclusion that the method of calculation proposed by Montgolfier is the most accurate, as it is also the most simple. If the pressure be ascertained in inches of mercury, it is only necessary to find the column of air in feet equivalent to the pressure, and to multiply this number (as in the common case of gravitating bodies) by sixty-four feet, and then the square root

of this product will give the velocity of discharge in feet per second. The equivalent height of the column of air in feet is found by multiplying the number of inches of mercury by 11,230 and dividing the product by 12, mercury being 11,230 times the weight of air. Allowing for a small loss by friction in the quantity found by experiment, the agreement between the theoretical and experimental quantities is extremely near. Rules are likewise given for applying these calculations to other gasses of different specific gravities, which are also applicable to chimney draughts and to the expansion of air by heat.

Daguerreotype.

The theory of this extraordinary (and in times past would have been considered magical) production, not having been developed by its inventors or discoverers, we gladly avail ourselves of the very ingenious suggestions proposed upon the subject by Martyn Roberts, Esq.; and communicated to the scientific world through the medium of the Philosophical Magazine, No. 117, for April.

The mode of conducting the Daguerreotype process, and its astonishing results in producing permanent pictures on silvered plates, by the reflection of variable intensities of light and shades, having been fully described in our Journal, we proceed, without further preface, to lay before our readers Mr. Roberts's views as to its theory.

"Although the Daguerreotype process has long excited intense iuterest in the scientific world, we have not as yet had an explanation of the wonderful effect produced. I believe that even M. Arago has failed to elucidate the theory; and not only has this great philosopher been foiled, but the inventor of the process is unable to solve the problem; with these facts before me, I feel it almost presumptuous in so humble a votary of science as my-

self, to attempt an explanation of the cause of the production of Daguerreotype pictures, but if my attempt has the effect of directing attention to the right path for arriving at a solution of the question, I shall be satisfied. We all know that light has a powerful influence on crystallization; solutions that will not crystallize in the dark, instantly form on the admission of light; the crop of crystals is always more copious on the enlightened side of a glass, containing a crystallized liquid, than on the dark side.* Ice forms more rapidly during moonlight, and on the break of day, than on a dark night; but I need not adduce examples of the influence of light on crystallization, for the fact is allowed by all scientific men.

Let us then suppose, that in the Daguerreotype process, the cleansed silver plate is exposed in the dark to the vapour of iodine; this deposits itself in a flocculent or powdery state on the plate, unable to form the peculiarly shaped iodic crystals, from the absence of light; but yet all other requisites being present, it may be considered in an incipient state of crystallization, or balanced so finely, that the admission of the excitant light instantly throws it into plate-formed iodic crystals, but only in those parts where the light has impinged, and here its perfection of, or continuity of crystallization, is merely in proportion to the intensity of light.

Having now the iodated plate removed from the camera obscura, where it has undergone a surface crystallization, more or less perfect in those parts where the lights and shades have fallen, we submit it to the mercurial vapour; the atoms, vesicles, or globules of this vapour being very minute, attach themselves to all the minute inequalities of face in the iodine; on those parts which are fully crystallized, the vapour is precipitated on the flat tabular surface of the crystals, and here offering a continuous and equal angle of reflection to the eye, it appears white and resplend-

* For instance, see the glass show bottles in chemists' windows, containing camphor evaporated, and deposited on the side of the bottle next the window, and not on the reverse side, or that toward the interior of the shop.---Ed.

ent. On the non-crystallized or imperfectly crystallized surface of the iodine, which being in a measure powdery and offering no determinate angle of reflection to the eye, the mercurial vapour adheres, but in no flat surface or continuous determinate angle capable of reflecting a mass of light; it may be said it is here unpolished.

Again, may not the angle under which it is necessary to view a Daguerreotype picture, be that of the facet of the iodic crystal, and this be a further confirmation of my theory? The mercurial vapour covers the whole of the iodine, and thus protects it from the further action of light.

Such are the crude views I have formed on this subject, and I trust they may lead to a further elucidation."

Scientific Adjudication.

WOODCROFT'S PETITION FOR THE EXTENSION OF A PATENT RIGHT.

(Continued from page 135, Vol. XVIII.)

Was there no balance sheet in which the accounts were displayed, item by item, so that you could come to a correct balance?—The balance would depend so much on the value of the machinery.

Of course you would put a value upon the machinery before you drew out that balance sheet, but was there no balance sheet with a debtor and creditor account, to be the foundation and material from which you made out your amount?—Yes, there were accounts submitted by both parties.

I should like to see the balance sheet on which the award was made up; you do not give their lordships exact information whether you put down any value for this patent or not.—It was valued along with the machinery.

Would that paper tell us the value of the machinery, if we had it,—is there no such paper in existence?—I think not.

Had you the assistance of an accountant?—No, we had not.

Can you take upon yourself to say that you put any value at all upon this patent?—Yes.

What was it then?—As I stated before, we might estimate this patent at a few hundred pounds; but there was no precise value put upon the patent—it was taken in along with the machinery.

Can you tell us what you estimated the machinery at?—The machinery was valued, as far as regards Mr. Bennett Woodcroft, at £4,000. We considered that to be probably double its value if it had been sold.

You valued it between the two, at double its value?—If sold.

Did you value the patent on the same principle ?—That was to include the patent. So much of the price as was to include the patent, was that valued upon the same principle of double what it might sell for ?—No : I think not.

I understood you to say that Mr. Bennett Woodcroft, at this time, had only one third-part of the proprietorship of the patent in him. Is that so ? —Yes.

Then that does not agree with the petition. I will read you a part of the petition and then ask you.

The petition states "that on the 7th September, 1831, the partnership was dissolved as to the said John Gould only." Was Mr. Gould formerly in partnership with John and Bennett Woodcroft ?—He was.

Then it recites "that the partnership was dissolved at the date mentioned as to the said John Gould, who thereupon in consideration of the sum of twelve thousand one hundred pounds, paid and secured to him by his former partners, your petitioner and the said Bennett Woodcroft, as and for the value his share and interest in the property and effects of the said partnership, business delinguished and assigned to your petitioner and the said Bennett Woodcroft, all his share in the patent right, machinery, improvements, fixtures, stock in trade, and other effects of the said partnership concern ; and after such dissolution the said business of cotton manufacturing, in Manchester, was carried on by the said John Gould and your petitioner, and Bennett Woodcroft took and continued the business of yarn printing in Salford." Was not Mr. John Woodcroft an equal partner with his father in the patent ? —No.

How did that appear to you ?—If I might be allowed to state the circumstances, that their lordships might really understand the case, I think I could shew in what way it arises. I have been acquainted with these gentlemen five and twenty years. I had been in business at that time, and in business with the house ; they often asked me to decide any difference that might arise between them. When Bennett Woodcroft invented this machine he was a servant of Woodcroft and Gould. They furnished the funds for obtaining the patent, and other expenses, and it was considered desirable that the patent should be the property of the concern. I negociated with them on the part of Bennett Woodcroft, the patentee, to allow him to be introduced into the concern as a partner, and to have a small share in the whole of their business, instead of his giving them a license to make goods under his patent. They agreed that he should become a partner, and it was also agreed that the patent, from that time, should become the property of the concern, not the individual property of Mr. Bennett Woodcroft.

That would be put down in writing, of course ?—It was.

Mr. Hill : then that must be produced. We cannot hear that at all.

Lord Brougham : The learned counsel has got more than he likes. (To the witness) : You say two or three hundred pounds might be the value of the patent in the year 1835—do you mean two or three hundred pounds, or from six to nine hundred pounds. Did you mean to speak of Bennett Woodcroft's share, in estimating the value of the patent in 1835, at from six to nine hundred pounds. Do you think it was worth so much at that time ?— We made no distinction between the patent and the machinery, for it certainly was not considered of much value at that time, in consequence of the state of the trade.

Do you think, casting your mind back to the year 1835, the patent was worth as mnch as eight or nine hundred pounds in the year 1835, or only two or three hundred pounds ?—I should think that £900 was the full value ; £300 for Bennett's share.

You think it was worth as much in 1835 ?—I should think not.

Was it worth more than two or three hundred pounds ?—I should rather say that was my opinion.

You think that, in 1835, the patent was not worth more than two or three hundred pounds ?—I think so, for the representation of the parties was, that it was of no value whatever.

The Right Hon. Dr. Lushington : It would not have fetched six hundred pounds in the market ?—I think not.

Mr. Hill : You have not been a printer yourself ?—No.

You have been acquainted with the operation of printing ?—I have seen it.

You have no peculiar knowledge of it ?—No.

With regard to the business carried on at these premises, I believe the rent was £340. Are you able to say that no other business was carried on than the printing of those yarns under the patent ?—I may not be able to say that there may have been.

Re-examined by Mr. Teed : I think you say that the value set upon the patent in 1835 was in consequence of the depressed state of the trade ?—Yes ; the depressed state of trade at that time.

Has the trade revived since ?—It has revived since.

Lord Brougham : Suppose the state of trade had not been depressed, but had remained, and that no change had taken place, such as happened in 1839, in the value of the patent by the French applying it to silk, should you then have said that the patent would have been worth more than what you have already stated, two or three hundred pounds ?—I should think not. It is the revival of the trade in the introduction of the silk that certainly gives it a value.

Between 1835 and 1839 the mere revival of the trade would not have given much increased value, supposing the application of it to silk had not taken place ?—I stated in the onset, that owing to the taking off the duty on printed calicoes, that operated against the value of this invention. That depression continued, and it was not until the introduction of the French silks that this invention was brought into more extensive use, and within the last year its value has very materially increased, and that is the reason why the desire of prolongation exists, which did not previously.

Mr. James Bevan sworn. Examined by Sir Wm. Follett : Were you the manager of the works of Messrs. Ingham and Co. ?—I was.

In 1836 ?—Yes.

Do you remember Mr. Bennett Woodcroft trying any experiments at that time with regard to the printing of yarns ?—I do.

Where were the experiments made ?—At Blackford Bridge, near Bury.

At Messrs. Ingham's works ?—Yes.

Whose workpeople were employed in making the experiments ?—Partly the workpeople of James Ingham and Co., and partly the workpeople of Mr. Bennett Woodcroft.

Did they continue for a considerable time ?—They did.

Do you know whether there was much expended as regarded the workpeople, and so on ?—There was considerable expense.

Was Mr. Bennett Woodcroft constant in his attendance to that himself ?—He was.

How long was it, days, or weeks, or months ?—It was weeks or months.

We understand he suceeded in his invention ?—He did.

Did Messrs. Ingham and Co. after that print any yarns for Messrs. Woodcroft and Co. ?—They did.

Was there any difficulty at that time in getting workmen ?—There was.

Does it require any time to instruct the printers in the mode of printing ? —The attention to the yarn requires considerable time.

I believe Messrs. Woodcroft and Gould afterwards printed on their own premises ?—I believe they did.

From your knowledge of it, do you conceive they could have made any profit at all until they printed on their own premises ? It requires a con-

siderable time to get it into operation in the way you speak of?—It did.

Cross-examined by Mr. Hill: How long were you in the employment of Bennett Woodcroft?—I really do not recollect, I made no note of it, but I was not in the employ of Bennett Woodcroft at all.

Did Bennett Woodcroft ever carry on the trade of printing yarns to Ingham and Co?—The experiments were made for them, and we after that printed for them, I mean Woodcroft and Gould.

How long did Ingham and Co. continue to print forWoodcroft and Gould?—I cannot speak positively to that.

As near as you can—was it six months?—Yes; more than six months.

Twelve months?—Twelve months I should suppose.

In what year would that be?—From 1826 to 1827. The commencement of their experiment was, I believe, in 1826.

When did they cease to print at that place altogether?—I really do not recollect.

Was it in 1837?—I believe it was.

What is your trade?—Calico printer.

Do you know any thing of silk printing?—As a fabric or as a warp?

Printing in the warp.—I have made some experiments for Mr. Woodcroft.

When?—In 1828.

In printing silk?—Yes.

Give to their lordships the nature of those experiments. What did you do?—It was merely carrying out his views as regards his printing of cotton.

I do not understand what you mean by "carrying out his views." Tell us what you did?—We printed a small silk warp.

A warp is a collection of yarns, is it not?—Yes.

Why did you do that instead of Mr. Woodcroft?—When I say I did it, I do not not mean exactly that I did it as a principal in the concern, it was under my direction as a servant.

Why was it done at Ingham and Co.'s instead of at Woodcrofts?—Messrs. Woodcroft had not at that time works of their own.

Do you mean that in 1828 they had not works at which to print those warps?—I believe it was in 1828.

At whatever time it was, do you mean to tell my lords that Woodcroft and Co. had not machinery and apparatus to print those warps?—They had not machinery at that time.

Not three years ago?—In 1828 it was.

I thought you said three years ago. Have you made no experiments for them since 1828?—I have not.

Was this at the time the other experiments were going on?—After the other experiments.

Do you remember at what time in 1828 it was?—I do not.

Was it in the summer part?—I do not recollect.

You say you made experiments: what did you do—Did you prepare the warp?—No.

Who prepared the warp?—Mr. Woodcroft.

It was brought to you in a prepared state was it?—It was.

In what state was it when you saw it?—It was equally dispersed on the beam, the ends of the yarn.

Is that what is called technically "beamed?"—Yes; not being a manufacturer, those terms I do not exactly know myself.

Is that a warp? [Exhibiting the same.]—Yes.

Was it brought to you in this state?—It was.

Fastened in this way at the ends?—It was on the beam in that way.

This represents the beam, does it?—Yes.

Do you remember what was the length of it?—No, I do not.

You say it was a small one?—Yes.

I do not ask to a foot or two, but give my lords a notion what length it was.—I cannot say.

But you can say whether it was a foot or a hundred feet?—It was more than a foot, but whether it was a hundred feet, I cannot say.

Lord BROUGHAM: Do you mean to say you cannot state whether it was a foot or 100 feet?—We printed by weight, and therefore did not measure them.

And cannot you tell whether a foot or 100 feet?—It was nearer a hundred feet, I should say, than two feet.

Mr. Hill: Were there any cross-lines in it?—There were not.

Not from beginning to end?—No.

Then there was nothing to hold it together, except the being confined at the two ends?—No.

Do you know what became of the warp after you sent it back?—I do not.

Did you ever see it in a manufactured state?—I do not recollect.

Was it done at a machine made on purpose for silk, or at one at which cotton warps were printed?—It was done at one that was made for the purpose of printing calicoes, but converted to printing cotton yarns.

Then you might have answered my question in one word. It was done at a machine that was prepared for printing cotton yarns?—Yes.

Did you make a good job of it?—That I really cannot speak to.

You can. Did you print the warp in such a way as, if manufactured, it would have made a good pattern upon silk?—That I cannot speak to. Being unacquainted with the manufacture, I cannot speak to that.

Whether it succeeded, then, or not, you do not know—I do not.

Lord Brougham: Did it look like that sort of thing you have just seen?—Yes, it did.

Mr. Hill: Did you ever hear from Bennett Woodcroft whether it succeeded or not?—I did not, that I remember.

That was, you say, by way of experiment. Did you repeat the experiment on silk afterwards?—I am not aware that we did.

Did you ever manufacture any silk?—Never.

Are you in Ingham's employ now?—I am not.

Do you manufacture for yourself?--No.

Was the silk printed at a cylinder machine or a block machine?--At a cylinder machine.

At an engraved cylinder machine?—Yes.

I think you say you have had nothing to do with silk since that time?—I have not.

What did you mean by saying that the attention to yarn required time?—From not being accustomed to it. When we commenced with it, it was a new art, and the men were not acquainted with the manner that it required. My business being a calico printer, it was quite a different thing.

Can you make a printed yarn from the specification? From the specifications and drawings I could.

You say something about dealing in yarn. Did the Woodcrofts deal in yarn? Did they buy yarn, then print it, and sell it to the trade? That I do not know.

You told my learned friend you could not tell him the price of the printing, because it was all priced in the yarn. I am not aware that I said that.

You do not know what the price of the printing was? Yes, I do.

What is the price of the printing? The price that we charged them for printing alone was a shilling and sixpence a lb.

They finding the yarn? Yes; and finding part of the workpeople.

Do you mean that you did not know what price they charged for the printing, and therefore could not tell the profit? I mean to say that I did not know the price that the yarn was worth, and did not know what they sold it at.

Is the usual mode by which printing is done, to print the yarn for them who bring the yarn, and charge a certain price for the printing? That is the way we did.

Is that the course of the trade in Manchester? I am not aware that any one did it but us at that time.

And you do not know now that it is the course of the trade? I am not acquainted with it.

Lord Brougham: You say that by the specification, and consulting the drawings annexed to it, you could print from it without difficulty?—I could.

It is sufficiently distinct and intelligible to work by? Quite so.

Could you print silk? I could.

Without any further assistance? Without any further assistance.

Mr. Allan Royle was next examined. He stated that Mr. B. Woodcroft had been engaged in making experiments about a year and a half, at an expense of 2 or £300, which was paid by Woodcroft and Gould. There was no demand for the goods when the patent was first obtained; but shortly afterwards, viz., in 1829, a demand arose, and new machinery, to the value of £5,000 was obtained. This demand continued up to 1832. They printed some silk yarns in 1830, but there was no demand for them. The process was precisely the same as printing cotton. From 1835 to 1838, there was no profit whatever from the patent. In 1832, there was a profit on the printing of £849; in 1833, it was £1,277; in 1834, there was a loss of £378. 12s. 11d.; and from 1835 to 1839, there was no profit at all.

Mr. John Gould was examined at some length as to the expense incurred in machinery, &c., but his evidence was not material.

Mr. John Davies, who had been in Woodcroft's employ for 16 years, stated that they commenced printing silk in 1839, and that up to January in the present year they had printed 3526 lbs. weight. The charge for the license for printing on silk is 3s. per pound, which would amount to £520 0s. 7d. The amount received for licenses was £743 8s. 3d., and on the 3rd of February there was a sum of £633 to receive. In cross-examination, he said that they began to print silk in February, 1839. The first warp they printed was a pattern warp for Mr. Winkworth, which was prepared by him, and sent to them on a beam with cross-picks in it. The only alteration in the machinery was, that instead of the reeds used for cotton, others were put in. The witness was then called upon to describe minutely the mode in which the printing of silk varied from the printing of cotton.

Mr. Le Mare, silk manufacturer, stated that he was one of the first who began to use the patent process of printing on silk, in 1839. Something like it had been submitted to him some years before, but he did not pay particular attention to it. He considered the invention a valuable one, as it opened a new era in the silk trade, being an article purely of fancy.

By Mr. Teed: In printing these silks are they done by Mr. Woodcroft's patent? I suppose they are, I am not acquainted with the detail.

Do you know whether they can be printed with or without the shutes across? They can be printed without the shutes across.

Mr. Hill: Do you mean cross-picks? Cross-picks. When it was first introduced in the early part of last year by English manufacturers, we had not arrived at the perfection that we have now of getting perfect patterns. A small quantity of this work was combined with other modifications; the warp consists probably of 3000 threads, and of course these cannot be fixed across, because that which was eighteen or nineteen inches wide, would probably have to be divided into a dozen or fifteen, and therefore we could not have those cross-picks.

Mr. Teed: Then they were printed merely upon the warp? Yes.

Kept in its place by the distention? Yes; but at the same time there have been patterns printed without picks across. Here is a tiger-lily. This has been printed without the picks across, and yet you can make out what the pat-

tern is. We have used this pattern and have had it divided. It has been divided probably in a dozen different places in the course of the weft, and yet we have preserved the pattern quite sufficient to distinguish what it is, as it is here.

It imposes, perhaps, more care upon the weaver?—More care upon the weaver, decidedly.

Do you consider this invention a valuable one?—Yes, very valuable.

Are fancy goods in silk more valuable than fancy goods in cotton?—They are much more expensive.

Have English goods, since the use of this pattern, been more saleable than before. Have you had a greater demand for them?—There has been a very great demand for these silks, because it opened, as I said before, a sort of new era in the trade. Every thing of this sort gives a new impetus to it.

Has it enabled you to compete more successfully with foreign manufacturers?—Yes.

Lord Brougham: When you say that you consider the invention very important and very valuable, is that as originally used, or in the application of it to silk?—In the application of it to silk; I speak of it as a silk manufacturer.

Mr. Teed: Would the same effect be produced in the ordinary mode of printing upon silk?—I am not aware.

They can print upon woven silk?—Yes, but then the pattern would only be presented upon one side.

That is a piece of printed silk? [Shewing a pattern to the witness.]—Yes; this I apprehend to have been printed upon the cloth.

Is that the same pattern with a difference of ground?—It appears to be the same.

Then on both sides the effect is, that one is a hard outline and the other very soft?—Yes, there are cases in this work in which it does not appear on both sides, such a case I will just present. This will give an idea of it. With this bouquet of flowers the pattern is very imperfect upon the other side.

[*To be continued.*]

List of Patents

That have passed the Great Seal of IRELAND, from the 17*th March to the* 17*th of April,* 1841, *inclusive.*

To William King Westley, of Leeds, in the county of York, for certain improvements in cleaning, combing, straightening, and preparing for spinning, hemp, &c.—Sealed 25th March—6 months for inrolment.

James Davis, of Walcot-place, Lambeth, in the county of Surrey, Esq., for improvements in the manufacture of soap.—Sealed 25th March—6 months for inrolment.

John Wertheimer, of West-street, Finsbury-circus, in the city of London, printer, for an invention of certain improvements in preserving animal and vegetable substances and liquids,—

being a communication from a foreigner, residing abroad.—Sealed 25th March—6 months for inrolment.

Charles Payne, of South Lambeth, in the county of Surrey, gent., for improvements in salting animal matters.—Sealed 25th March—6 months for inrolment.

Frederick Steiner, of Hyndburn Cottage, near Accerton, in the county of Lancaster, for improvements in looms for weaving and cutting asunder double piled cloths; and a machine for making wefts used therein.—Sealed 25th March—6 months for inrolment.

James Molyneaux, of Preston, in the county of Lancaster, linen draper, for an improved mode of dressing flax.—Sealed 26th March—6 months for inrolment.

William Mc Murray, paper-maker, at Kenleith Mill, near Edinburgh, in that part of Great Britain called Scotland, for certain improvements in machinery used in manufacturing paper.—Sealed 1st April—6 months for inrolment.

Charles Cameron, Esq., lately in Her Majesty's 18th Regiment of Foot, and at present residing at Mount Vernon, in the county of Edinburgh, for certain improvements in engines to be actuated by steam or other elastic fluids.—Sealed 14th April—6 months for inrolment.

Francis Sleddon, Junr., of Preston, in the county of Lancaster, machine-maker, for certain improvements in machinery or apparatus for roving, slubbing, and spinning cotton and other fibrous substances.—Sealed 14th April—6 months for inrolment.

List of Patents

Granted for SCOTLAND, subsequent to March 22nd, 1841.

To Joseph Stubs, of Warrington, file manufacturer, for certain improvements in the construction of screw wrenches and spanners, for screwing and unscrewing nuts and bolts,—being a foreign communication.—Sealed 26th March.

George Henry Fourdrinier, and Edward Newman Fourdrinier, both of Hanley, paper-makers, for certain improvements in steam-engines for actuating machinery; and in apparatus for propelling ships and other vessels on water,—being a foreign communication.—Sealed 31st March.

William Mc Kinlay, of Manchester, engraver, for certain improvements in machinery or apparatus for measuring, folding, plaiting, or lapping goods or fabrics.—Sealed 31st March.

Charles Green, of Birmingham, gold plater, for improvements in the manufacture of brass and copper tubes.—Sealed 1st April.

Henry Newson Brewer, of Jamaica-road, London, mast and block-maker, for an improvement or improvements in wooden blocks for ships' rigging, tackles, and other purposes where pullies are used.—Sealed 7th April.

John Barber, of Manchester, engraver, for certain improvements in machinery for the purpose of tracing or etching designs or patterns on cylindrical surfaces.—Sealed 8th April.

George Blaxland, of Greenwich, engineer, for an improved mode of propelling ships and vessels at sea, and in navigable waters.—Sealed 8th April.

James Pilbrow, of Tottenham, London, engineer, for certain improvements in steam-engines.—Sealed 8th April.

Robert Pettit, of Woodhouse-place, Stepney-green, for improvements in rail-roads, and in the engine carriages and wheels employed thereon.—Sealed 12th April.

William Samuel Henson, of Allen-street, Lambeth, engineeer, for certain improvements in steam-engines.—Sealed 14th April.

Henry Bessemer, of Perceval-street, London, engineer, for a new mode of checking the speed of, or stopping railroad carriages, under certain circumstances.—Sealed 20th April.

Hugh Graham, of Bridport-place, Hoxton, artisan, for an improved manufacture of that kind of carpeting usually denominated Kidderminster carpeting.—Sealed 21st April.

THE

London

JOURNAL AND REPERTORY

OF

Arts, Sciences, and Manufactures.

CONJOINED SERIES.

No. CXIII.

Recent Patents.

To Benjamin Hick, *of Bolton, in the county of Lancaster, engineer, for certain improvements in machinery or apparatus for drying cotton, woollen, and other fabrics, and other fibrous substances or materials.*—[Sealed 25th May, 1839.]

These improvements in machinery or apparatus for drying cotton, woollen, and other fabrics, and other fibrous substances or materials, consist in the arrangement and application of machinery and apparatus, whereby a stream or current of atmospheric air is brought into contact with, and along the surfaces of the goods to be submitted to the process of drying during their continuance and passage in and through a confined vessel or box, in such a manner that the moisture in them may be rapidly taken up and carried away, or any required degree of dampness or "condition,"

as it is technically called in the trade, may be left in the goods, and thus the process of drying may be performed more efficiently and advantageously than has hitherto been accomplished.

I will first describe one method of carrying my improvements into practical operation in drying cloth, and afterwards explain the arrangement of the machinery or apparatus more particularly by reference to the drawings,—see Plate IX.

The cloth to be dried is brought from the mangling, stiffening, or any other wet process, being wound upon a roller, and forming what is usually called a "catch." This catch or roll of cloth is placed upon a frame, and so arranged that the cloth may be unwound and extended or drawn horizontally along and through a chamber or vessel, which I call a drying-box, and wound upon corresponding rollers at the contrary end of the drying-box.

The figs. 1 and 2, shew a method of treating such rolls of cloth or batches on the frame, the cloth from each being drawn through the vessel one above the other, at about two inches apart, and supported at intervals by small rollers.

The air will in most states of the atmosphere, and with most descriptions of cloth, require to be heated, or otherwise dried, to increase its capability of absorbing moisture, for which purpose an ordinary coal or other stove, or a hot-air furnace, called a "cockle," may be used.

This stove or furnace is situated near one end of the drying-box, having suitable flues for conveying the heated air into the box, through which it is drawn in a continuous and uniform stream, by means of an exhausting fan, placed near the other extremity of the drying-box.

It is necessary here to observe, that I prefer to draw the cloth through the drying-box, in a direction contrary to the current of the air; and also that the air must be introduced

into the box at that end where the cloth is driest, and drawn out of it at that end where the cloth is wettest, in order to prevent any moisture, when once absorbed by the dry air, from being deposited upon the dried cloth.

It will be evident that the various descriptions of cloth will require different periods of time in drying, which may be easily obtained by altering the progression of the cloth through the box, or allowing it to remain stationary therein some time, or by changing the speed of the fan, or varying the temperature, or dryness and quantity of air, which is brought into contact with the cloth.

In like manner, any required degree of dampness or condition may be left in the cloth, to be accurately ascertained by the application of a hydrometer to the interior of the drying-box; but these and similar modifications will be easily adapted to the material to be operated upon, by those conversant with the business, without further description or explanation.

In order, however, that the above method of carrying my improvements into effect, may be rendered perfectly intelligible to the practical operator, I have attached to these presents a sheet of drawings, in which fig. 1, is a side elevation of the machine; and fig. 2, is a plan of the same; similar letters of reference denoting corresponding parts of the machinery or apparatus in each of the figures.

The side frames or castings *a, a, a, a,* are placed at suitable distances apart, at each end of the room in which the drying-box is situated, supporting a number of catches or rolls of cotton cloth *b, b, b, b,* each containing a number of pieces, stitched together, end to end, which are drawn through the drying-box *c, c, c, c,* in a horizontal line, one under the other, being supported at certain intervals by the transverse bearing rollers *d, d, d, d,* until they arrive at the other end of the drying-box, where they are again

wound upon similar rollers *e, e, e, e,* suitably mounted, to receive them.

This box is broken off in the figure, for want of space, but may be made about forty feet long, or more, where convenience will allow. One end or pivot of the catch-rollers is inserted in sockets, which slide in the frame *a,* in order to accommodate any width of cloth or length of roll; and the other end of the catch-roll is placed in a socket, which carries a worm wheel *f, f, f, f,* upon its outer extremity, in gear with the worms *g, g, g, g,* upon the longitudinal shaft *h, h,* which, by means of the upright shaft *i, i,* driven from the main gearing, will thus draw the cloth through the box *c, c,* and cause it to be wound upon the catch-rollers *e, e,* in a dried state.

The cross shafts *k,* and *l,* for driving the upright shaft *i,* are provided with reversed conical pullies, in order that the cloth may pass through the drying-box at an uniform speed, notwithstanding the varying diameters of the catches.

If desired, the whole may be readily thrown out of gear by means of the forked lever *m,* and the operation performed by hand. An apparatus is shewn at *n, n,* consisting of a lever, suspended by a pulley running on a rail above, for more conveniently lifting the catches in or out of their places.

The air, heated by means of the stove *o, o,* rushes in from the atmosphere through the apertures or air-boxes *p, p,* and is thus caused to impinge or strike against the cockle *q, q,* and thence discharged through similar apertures *r, r,* and conducted to the end of the drying-box *c, c,* containing the cloth. The air is drawn through this box by means of the revolving fan *s, s*; the arrows 1, denoting the direction of the air, and the arrows 2, that of the cloth under operation.

It will be perceived, that I am not in any way confined

or limited to the number of pieces or batches to be operated upon simultaneously, the speed of the cloth rollers, or the exhausting apparatus, or the material, form, position, or dimensions, of all or any part of the apparatus above described; or the degrees of temperature or absorbing power of the air to be thus employed. It is also obvious, that this arrangement may be modified by using the fan, to force the air through the drying-box, instead of drawing it through by exhaustion.

A similar arrangement or modification may be applied to the drying of yarns, warps, cotton, woollen, linen, silk, and other piece goods, and other fibrous articles and materials, to which my invention is generally applicable.

Having now particularly described the nature of my improvements in machinery or apparatus for drying cotton, woollen, and other fabrics, and other fibrous substances or materials, and one manner of carrying the same into effect, I desire it to be understood, that I claim, as my invention, the novel and peculiar arrangement, combination, and application of machinery and apparatus, and a current of air to perform the process of drying, in the manner and for the purposes shewn in the drawings hereto attached, and also herein particularly set forth.—[*Inrolled in the Rolls Chapel Office, November*, 1839.]

To John White, *of Manchester, in the county of Lancaster, engineer, for his invention of certain improvements in vices.*—[Sealed 23rd April, 1840.]

These improvements consist in a novel construction of a portable vice, the jaws of which are capable of expanding to a very considerable width, and of preserving their paral-

lelism to a greater extent than any of those in common use. These jaws are formed upon the upper end of very long levers or arms, having their fulcrums near to or on the floor of the platform. The vice is so constructed that it may be carried to the work, instead of the work being taken to the vice; and requires no fixing, its own weight being sufficient, in all cases, to keep it perfectly steady.

This improved vice is also furnished with a table, for the purpose of holding files, hammers, and other tools, close to the hands of the workman. A modification of this improved portable vice, is so constructed, that one jaw opens horizontally, whilst the other jaw remains stationary; and a still further modification of the vice allows one of the jaws to turn or swivel, in order to hold work which has not square or parallel sides, but are of a bevelled or irregular shape.

Plate X., fig. 8, represents a partial sectional elevation of one modification of the improved portable vice, consisting of a pair of jaws *a*, *b*, formed upon the upper ends of levers or arms *c*, and *d*, which are mounted upon fulcrum pins *e*, and *f*, and are thus supported upon the bed-plate or platform *g*, *g*. Each of the jaws *a*, *b*, contain a nut or box *h*, for the vice screw *i*, to bear in, which are so constructed as to preserve a perfectly parallel position with the screw, in whatever situation the holding jaw may be.

The opening of the holding jaw is also assisted by the plate *j*, and sliding guide rods *k*, *k*. This plate *j*, is provided with mortices or holes, for the reception of any tools not in immediate use, and is placed as a table or bench for the workman. The vice screw is protected from filings and dirt by a box or cover *l*, sliding in the opening of the holding jaw.

Fig. 9, a horizontal view of the vice, with the holding jaws thrown entirely back.

Fig. 10, is a partial sectional elevation of another modification or construction of a portable vice, in which the holding jaw *a*, is made fast or stationary, and the jaw *b*, only capable of moving upon its fulcrum pin *c*, when acted upon by the screw *d*. A mortice bed or table *e*, is employed for holding tools; and the foot-plate *f*, is for the purpose of supporting the holding jaws. Fig. 11, is a horizontal view of this vice, complete.

Fig. 12, is a partial sectional elevation of the other modification of the portable vice, in which the holding jaws are allowed to turn on swivels upon centres, in order to accommodate their holding surfaces to any bevelled or irregular shaped article.

The jaws *a*, and *b*, are mounted on their fulcrums *c*, and *d*, in bed-plates or frames *e*, *f*, which plates are enabled to turn upon a common centre pin *g*. The jaws may be held square, when required, by passing a pin *h*, through small holes in the plates *e*, and *f*.

This vice is assisted in its operations by means of the morticed tube *i*, *i*, being furnished with a descending weight *j*, which, as the screw is turned for opening the jaws, causes friction rollers *k*, *k*, on the sides of the table, to act against the inclined planes *l*, *l*, on the holding jaws, and thus open the jaws.

The nuts or boxes *m*, of the vice screw *n*, are turned spherically, acting in the circular openings in the holding jaws, and also facilitating their operations. The vice screw may also be protected by sliding a cap over it, and fitting the round box *u*.

The patentee lastly claims the construction of portable vices, which may be carried to the work instead of being fixed to a bench, and having the range of opening of the holding jaws of greater extent, and much more parallel, owing to their length, without being confined to the pre-

cise shape, form, or dimensions of those shewn in the drawings.—[*Inrolled in the Rolls Chapel Office, October,* 1840.]

To Henry Philip Rouquette, *late of Norfolk-street, Strand, in the county of Middlesex, but now of Mark-lane, in the City of London, merchant, for a new pigment.*—[Sealed 25th March, 1840.]

The patentee says, I take oxide of zinc, either in the state commonly called flowers of zinc, (by which I mean the fine particles that detach themselves, and are carried off by the strength of the fire, in the manufacture of zinc or spelter) or in the state of scoria or sublimate, as it is found in the upper part of furnaces, where iron or other ore containing zinc or spelter is worked, and in that state commonly called tutty; or in the state of dust, dross, or scum, as produced by the re-melting of the metal in zinc rolling works, or as it is found, sublimed or otherwise, in factories where brass is made; or I take a mixture of flowers of zinc, in equal parts, with either of the other before-named materials, which I prefer and submit it to my first, or burning process, as follows:—

Having spread it in a finely pulverized and sifted state, on the bottom of an ordinary oven or furnace, in a layer of about two inches thick, I heat it till it ignites, keeping the bottom of the oven at a cherry-red heat, as long as any flame is emitted from the layer, and stirring the layer the whole time. When it ceases to flame, the burning for the purposes of the said invention is completed, and the ashes or remaining oxide being removed from the oven, are put into iron troughs to cool, and when cool, are passed through a fine sieve. The fine powder thus obtained, I

then submit to my second process of washing or elutriation, which may be accomplished by any of the ordinary methods, but that which I prefer is as follows:—

I place a cask, filled with pure cold water, on a stand about three feet from the ground. This cask must have two discharge holes in it, one above the other, (the lower one being about one-third of the height of the cask, from the bottom, and the upper one about two-thirds) these holes must be stopped with plugs; the aforesaid sifted oxide or product, from the oven, being placed in the water, it should be stirred briskly for a minute or two with a stick, and the upper plug then removed, when the water, which will be highly charged at first, should be allowed to run off into a vessel placed below to receive it.

It should be allowed to run off in this manner till the water runs clear, when the upper hole should be plugged again, and the lower hole opened, and the discharge allowed to continue till the water also runs clear from that hole, and then the lower hole should be plugged again. The liquid mixture thus obtained, should be allowed to settle, and the clear surface water then poured off. The sediment thus obtained should then be placed in a slow oven, or in the sun to dry, partially; and when, by evaporation, it has become of the consistence of paste, it is to be cut or divided into cakes of three to four, by two to three inches in size, and replaced in the slow oven, or exposed to the sun to be thoroughly dried. In this state the cakes are to be ground with oil in the same manner as white lead cakes are now treated, and when so ground, make the said pigment; more or less oil or tar being used, according to the purposes for which I require it.

Now, whereas, I claim as the said invention, a pigment formed by oxide of zinc, produced by burning, washing, or elutriation, and drying, as aforesaid, unmixed or mixed

with oil, or other suitable liquid; and if mixed, then in proportions varying according to the purposes to which the said pigment is to be applied.—[*Inrolled in the Rolls Chapel Office, September,* 1840.]

To HENRY DIRCKS, *of Liverpool, in the county of Lancaster, engineer, for certain improvements in the construction of locomotive steam-engines, and in wheels to be used on rail and other ways, part of which improvements are applicable to steam-engines generally.*—[Sealed 12th May, 1840.]

THE first part of this invention, namely, improvements in the construction of locomotive steam-engines, consists in a novel arrangement and construction of exhaust or exit pipes, by which the eduction steam from the cylinders is conducted into the chimney, and at the same time is caused to act in very small jets upon the gas smoke, or heated vapour, toward the back ends of the tubes in the boiler, and thereby produce a consumption of the smoke emitted from the furnace, in those engines where coal is used, and the boilers are of a tubular construction.

The principal feature of this improvement consists in dividing the exhaust or eduction pipe (which is placed in the smoke box of the engines as usual) into a series of small branches or tubes, and so arranging or spreading these tubes that they may be opposed to most of the ends of the boiler tubes, in the smoke box; and, as the exhaust branches or tubes are perforated with small holes on those sides of the pipes opposed to the tube ends, the steam will blow out upon the orifices at the ends of the boiler tubes, in very fine jets, and thus prevent the emission of smoke.

This part of the improvement is applicable to steam-engines generally.

Secondly,—improvements in the construction of wheels to be used upon rails, or other roads, or ways, which consist in forming the tyre of the wheel of cast or wrought iron, having a channel or groove formed in it, to be filled with blocks of wood, the grain of the wood being placed radially or endways all round, in segments, and which are afterwards bolted or riveted, or otherwise fastened in the channel of the tyre, presenting a wooden periphery or rim to the road or way.

The wood used for this purpose is African oak, British oak, beech, or other hard wood, previously soaked or saturated with coal gas tar, and impregnated therewith by means of hydraulic or other pressure, in order to fill up its pores, and thus prevent the admission of moisture.

Instead of the use of hard woods, softer timber, such as larch, &c., may be employed, and previously squeezed or pressed into more perfect solidity; and it is further observed that the wood may be otherwise chemically prepared, in order to prevent the admission of moisture, or the pores may be filled by any oily substances being either pressed into the pores of the timber, or introduced by vacuum, or other means.

In Plate X., fig. 1, represents a transverse section, taken vertically, through the smoke box of a locomotive engine boiler; and fig. 2, a longitudinal section of the same, exposing the ends of the boiler tubes, the cylinders, and the eduction or exhaust pipes. The smoke box is represented at *a, a,* attached, as usual, to the end of the boiler *b, b.* The tubes are shewn at *c, c,* which open as usual into the smoke box. The steam cylinders *d, d,* communicating, as in common, with the lower end of the exhaust or exit pipe *e, e.* This pipe, instead of beng carried

upwards directly into the chimney *f*, is branched or spread into several small pipes or tubes *g*, *g*, *g*, perforated with small holes in the sides, opposed to the tubes *c*, *c*, and are then again connected, at their upper ends, to the exhaust or exit pipe *h*, leading to the chimney *f*.

There is also an auxiliary pipe *i*, *i*, the cock of which is to be opened by the engine-man, to supply steam from the boiler to the branch pipes *g*, *g*, *g*, when the engine is stationary, and the supply cut off from the cylinders. The steam thus blowing out of the perforated exhaust pipes *g*, *g*, opposite the back end of the boiler tubes, will thus prevent the passage of smoke to the flue or chimney,

Fig. 3, represents a front view of the improved wheel; fig. 4, a side or edge view of the same; and fig. 5, a section, taken vertically through the middle of the wheel. *a*, *a*, represents the ordinary parts of a cast or wrought metal wheel, having the rim or tire formed as a channel or groove, in which are fixed the several segments of wood *b*, *b*, having the grain placed radially, and extending around the tire, in order to form the running or outer periphery. These segments of wood may be fastened into the metallic channel by various means,—by bolts or rivets, as shewn at *c*, *c*, or by turning a groove half in the metal and half in the wood, and running metal therein, as shewn at *d*, *d*. Figs. 6 and 7, represent detached segments, and shew both modes of fastening them to the metallic body of the wheel.

The patentee claims, firstly,—The improved construction and arrangement of the exhaust or exit pipe, used in combination with tubular boilers, in the manner and for the purposes herein set forth; and, secondly,—The combination of a metallic wheel with a wooden-faced tire, as before explained, without being confined to its precise mode of construction or putting together.—[*Inrolled in the Rolls Chapel Office, October*, 1840.]

To John Bertie, *of Basford, in the county of Nottingham, machinist, and* James Gibbons, *of Radford, in the same county, machinist, for their improved texture of the lace net hitherto called bobbin net, or twist net; and also certain improvements in lace machinery, in order to produce lace net with the said improved texture, either plain or ornamental.*—[Sealed 5th June, 1834.]

This invention consists in an improved texture of lace net, and certain improvements in lace machinery, in order to produce the same.

The difference between the present improved texture, and the ordinary kind of bobbin net lace, consists in the employment of coupling threads, which proceed along the length of the piece of twist lace net by longitudinal zig-zag courses; and in so proceeding, form linked or looped couplings, suitably for uniting the ordinary twisted pillars together, into the form of hexagonal meshes, as shewn in Plate X., fig. 13, in lieu of traversing threads, which proceed in diagonal courses from selvage to selvage, with contrary obliquities; and in so proceeding form oblique crosses, in uniting the ordinary twisted pillars together, into a like form of hexagonal meshes.

When wide lace is made, which is afterwards required to be slit up, or divided into narrow ribbands or slips of lace net, called breadths; the several breadths are usually kept together, during the operation of weaving bobbin net of the ordinary texture in the machine, as well as in the subsequent operations of getting up and finishing, by means of extra threads called lacing threads, which are introduced by the operation of the machiney, for the purpose of joining the selvages of the adjoining breadths together

whilst the net is joining, but which lacing threads can be afterwards drawn out in order to separate the breadths.

This same effect is produced in lace net, made according to the improved texture, by merely leaving out one of the longitudinal threads, at every place in the machinery where a division is intended to be made between two adjacent breadths; and then that coupling thread, corresponding to the longitudinal thread, which is so left out (and which coupling thread would have been twisted around that longitudinal thread, if it had not been so left out), will then form a lacing thread, to unite the selvages of the two adjacent breadths together, in the manner represented in the figure; and the said coupling thread, which is become a lacing thread, can be drawn out, in order to separate the breadths when required.

The improvements in the lace machinery, are expedients to adapt the operation of the parts of such machinery, to suit the difference in the disposition and arrangement that is required to be given to the threads on which those parts are intended to operate; and by means of these improvements, the necessity of traversing being avoided, the operation of weaving or producing twist lace net will be facilitated.

The following alterations must be made in the "Lever's Machine," in order to produce lace net of the improved texture:—The front comb bar must be made fast by setting its gage screws, so as to confine it from working, and keep it stationary; with its geats or spaces between the combs, in due correspondence with those of the back combs; and the comb bar wheel, with its bolt and connexions for racking the front comb bar, must be removed or disconnected.

If the "Lever's Machine" is to be used for making narrow breadths of bobbin net lace, the turn-again combs

and their bar must be removed, and the vacant spaces which their removal will leave in the row of back combs, must be filled up by casting the back combs anew in one unbroken row, the same as is usual in "Lever's Machines" for making wide pieces of bobbin net. The selvage guides with their bars must be removed, and the racking wheel for the same will thus become useless. The ratchet wheel on the axis of the racking wheel, which commonly has eight teeth in "Lever's Machines," must be changed for a new ratchet wheel with only six teeth.

The catch-bar wheels, for lifting and letting fall the catch bars, with their ratchet wheel, must also be removed and others substituted, which are cut with their notches suitably for producing a regular succession of alternate rising and falling motions of each catch bar. The usual pump handle lever, by which the back catch bar is lifted or let fall, when either of the join bars come down, and go up again, must be disconnected from both the point bars, being useless.

The usual half-way or dividing stop, which is provided for the purpose of detaining the landing bars from opening beyond the proper dividing position, when the catch bars are to be let fall into the notches of the divided carriages, must be adjusted so that it will catch and detain the back landing bar; when the two landing bars are quite down or closed together as far as their screws will permit, that is at the usual position for exchanging catch bars, instead of detaining the landing bars when they are a little separated as usual.

The ratchet wheel at the back of the machine, which takes the said half-way or dividing stop out of action, whenever the point bars take up the meshes of the net, must be removed, and another substituted with only six teeth, instead of eight teeth as usual; but it is to be turned in the usual manner.

The point bars must be adapted to come down lower than usual in the act of taking up, because they must take up all the twist, instead of their usual action of "hugging the twist;" and for that purpose, the points must be made to descend nearly as low down as the tops of the bobbin carriages.

The stopping or rapping screws, which are provided at the back of the machine, to limit the rising and falling motions of the point bars, must be suitably regulated; and the connecting levers, which transmit the motion of the treadles to the point bars, may be altered in their lengths so much, as that the usual extent or depth of treading motion, will produce the requisite motion of the point bars.

The usual row of leads of single tier guides, must be removed from the guide bar, and a new set substituted, which are only half as numerous in any given width as in "Lever's Machinery," but which are the same as in double tier machinery.

The guides which are commonly used in warp frames may be used, but another guide bar must be introduced, being furnished with a row of similar guides of double tier gage, so that the two rows of guides will stand the same as is usual in double tier machines; and the two comb bars must be suitably adjusted in respect to the two rows of guides, in order to put the two rows of combs at a proper distance as under, to leave room for the two rows of warp threads to pass up between them in such manner that the two rows of guides may be racked independently of one another, as in double tier machinery.

The ordinary racking wheel for the guide bars, must be removed from the axis of the racking wheels, and two other racking wheels substituted, each with six places where steps, or rises and falls, are to be made, correspond-

ing with the six teeth of the ratchet wheel; one of these wheels racking the front guide bar, and the other the back guide bar, with suitable racking motions, for producing twist lace net with the said improved texture.

An additional warp roller must also be applied, to supply warp threads to the additional row of back guides; but the usual warp roller may be used to supply warp threads to the row of front guides. Each of the said warp rollers has only half the usual number of threads warped upon it, and they must be so placed in the machinery as not to interfere one with the other; hence, if the original warp roller is of a large size, it may be proper to change it for a smaller one.

The above-mentioned alterations being made in the ordinary "Lever's Machine," in preparation for working the same according to the said improvements, the warp threads are to be inserted through the eyes of the two rows of guides, in the same manner as is used in double tier machinery, except that they are supplied from two warp rollers instead of one.

In order to carry the improvements into effect upon that kind of lace machinery which is commonly known by the name of circular bolt, or circular comb double tier machinery, the following alterations must be made in such machinery:—

The front bolt bar, or comb bar, must be made fast by its gage screws, with its bolts or combs in exact correspondence with those of the back bar; the racking wheel for the said front comb bar being removed or disconnected, as before explained respecting "Lever's Machinery."

The point bars in many circular bolt, or circular comb machines, operate by the mode which is termed "hugging the twist," whereas according to these improvements, the point bars operate by the mode which is termed "taking up

all the twist"; wherefore such alterations must be made in the point bars, and the necessary mechanism, as may be requisite, in order to qualify the point bars for so taking up all the twist.

The guide bars, and their rows of guides, as they are usually made in double tier machinery, will not require to be altered, but an additional warp roller must be introduced, in order to supply one of the rows of guides with threads, the other warp roller supplying the other two; each of the two warp rollers, having only half as many threads warped upon it, as are usually warped on one roller, for making net of the ordinary texture of bobbin net lace.

The front row of guides is threaded with threads supplied by one of the two warp rollers, which threads are to become longitudinal threads, in the lace net of the improved texture; and the back row of guides is threaded with threads supplied by the other of the two warp rollers, which threads are to become coupling threads in the said improved texture.

The front row of bobbins, in the bobbin carriages, will supply coupling threads, and the back row of bobbins will supply longitudinal threads. The racking wheels of the two guide bars must be changed for two new ones, which are cut with twelve steps, as shewn in figs. 14 and 15; in which, fig. 14, is the front guide bar racking wheel; and, fig. 15, the back guide bar racking wheel.

These racking wheels are turned by a ratchet wheel of twelve teeth, if the machine is a hand circular bolt, or circular comb machine; but if it is what is termed a rotary circular bolt, or circular comb machine, the racking wheels are larger, but are cut with like steps to the above, and must be suitably connected with the wheel-work of the revolving driving cams, or of the revolving cranks, by which

the vibrating motions of the carriage are produced; so that the said racking wheels will make one complete revolution, during the time that both rows of bobbin carriages perform three complete vibrations.

A description of the working of these altered machines is not necessary, as the same will be evident to any competent workman.

Ornamented lace net, with the improved texture, is produced by the above machinery, by the addition of what are called "preventers or detainers," hereinafter described; the ornaments being of the nature of what is commonly termed fancy work of bullet holeing, consisting of holes left in the net at various places, according to a figured pattern.

A bullet hole will be left in bobbin net lace of the ordinary texture, when the crossing of two traversing threads over each other, is omitted, for the two succeeding hexagonal meshes will run together into one hole. The same effect will be produced in lace net of the improved texture, whenever a linked or looped coupling of two coupling threads is omitted to be made in the net, for the two succeeding meshes of the net will be joined into one, and a bullet hole will be formed, as represented in fig. 13.

The means of leaving such bullet holes at any part of the lace net of the improved texture, consists in preventing particular back guide threads from racking, so much as the other back guide threads are racked at particular times, when the coupling threads are to be linked or looped together in consequence of such racking; therefore, by preventing that racking of particular threads, the linked couplings of those threads will be prevented.

This is effected by a preventer or detainer, applied just previously to the time of racking, at the left-hand side of any one of those coupling threads which belong to the row of back guides, so as to detain and prevent that parti-

cular guide thread from racking, while all the other back guide threads are racked to the left; then in that case the particular coupling guide thread which has been so detained, will miss being linked or looped by its corresponding coupling thread in the front row of bobbins; and, in consequence of so missing, a bullet hole will be formed in that part of the net, which should have been made complete, by the coupling guide thread that has been detained and prevented from racking.

The mode of applying detainers, or preventers, to any of the coupling threads in the back row of guides in a "Lever's Machine," is shewn in fig. 16. The preventers *a*, are slender elbow levers, cut out in the shape of the letter L, in metal plate, and a number of them are placed side by side in a row, within the spaces of a sort of comb *b*, which serves to support them; they play upon a centre pin *c*, which is put through holes at the lower part of the comb support *b*, and the said pin passes through a hole in the elbow part of each preventer.

The supports *b*, for the preventers, are cast in leads in the manner of combs, and they may be of the same gage or distance asunder as the taking-up points of the machine. A row of leads of supports, is to be placed against the inside flat face of the back comb bar *g*, adjacent to the back guide bar *f*, with a space in the row of supports, corresponding to every guide in the back row; and as many preventers may be lodged in the said spaces, being all mounted on the aforesaid centre pin *c*, about which each preventer is moveable in the manner of an elbow lever; but every one of the preventers is quite independent of all the others, in such movements about their common centre pin.

When the preventers are in their places, as shewn in fig. 16, their upper ends, which are bended forwards, will

stand a little higher than the tops of the back guides, and a little behind them. The long tails of the preventers reach out backwards from under the back comb bar *g*, so as to extend behind the same to a sufficient distance for being operated upon by pins, which project out from the circumference of a cylindrical barrel *d*, in the same manner as the pins in an organ barrel.

This barrel is mounted, with its axis horizontally, and parallel to the back comb bar, in suitable bearings, fixed at the back of the machine, so as to admit of being turned round very easily by means of a toothed wheel or ratchet rim *e*, fixed upon one end of the barrel, which, when it is turned round, brings its various pins in succession beneath the extreme ends of the tails of the preventers, so as to lift the same upwards; by which means the upper ends of the preventers are advanced forwards over the back row of guides, so as to enter between the back row of guide threads. But as soon as by the revolving motion of the barrel, the pins pass away from beneath the extreme ends of the tails of the preventers, those tails descend by their own weight, being made heavy for that purpose; and by that descent, the upper ends are withdrawn from between the back guide threads out of operation, and remain so, until by the progressive revolving motion of the barrel, other pins are brought into operation beneath the said tails.

The extreme ends of the tails of the preventers are received in the spaces of a slea *h*, which is a row of leads, like the pushers, or dividers, commonly used in "Lever's Machines," but which become useless when the same are worked according to the said improvements; and may be screwed to a bar in a row, to form a slea, for retaining the tails of the preventers at equal distances apart, side by side

in the row, so that they cannot escape laterally from being lifted up by the action of the pins in the barrel.

The preventers are applied in the same manner to circular bolt, or circular comb machinery.

The patentees claim, first:—The improved texture of lace net, hereinbefore described and represented in fig. 13, which texture resembles the lace net hitherto called bobbin net, or twist net, very closely, because the four twisted sides of each hexagonal mesh is the same as bobbin net, or twist net, of the ordinary texture; but the two other sides being formed by looped or linked couplings of zig-zag longitudinal threads, in place of crosses of traversing threads, the said improved texture is more easy of production by machinery.

Secondly:—The modes, herein described, of actuating those parts of lace machinery, which operate immediately upon the threads, with such order and succession, and concert of movements, as will produce lace net of the said improved texture.

And, lastly:—The means, hereinbefore described, of producing lace net of the said improved texture, ornamented with fancy bullet holeing, according to a pattern, which is derived from the arrangement of pins projecting from the circumference of a cylindrical revolving barrel, in the manner of an organ barrel. Together with the apparatus, hereinbefore described, and called preventers; and by means of which, the action of pins of such a barrel, is transmitted to the guide threads, in order to operate thereon, in the manner required, for leaving bullet holes in any part of lace net, of the said improved texture.—[*Inrolled in the Rolls Chapel Office, December,* 1834.]

To Thomas Robinson Williams, *of Cheapside, in the city of London, gent., for certain improvements in the manufacture of flexible fibrous substances or compositions, applicable to covering buildings and other useful purposes; and also the machinery used therein.*— Sealed 28th September, 1839.]

This invention consists of an entirely new arrangement of machinery, partly well known when separated into individual machines, but now, for the first time, combined and arranged for this particuar purpose.

The desirable objeet intended is to adapt it to the manufacture of a durable and substantial covering for buildings and other uses, by uniting, with a large proportion of fibrous materials, peculiarly prepared, an admixture of natural bitumens, or other bituminous substances, and mixtures therewith of other materials which may not be bituminous, as well as for a peculiar and novel mode of saturating the so prepared fibrous materials therewith.

The fibrous materials most preferred for the foundation or tissue of this manufacture, are the waste flax or tow of the linen spinning mills, and the common plasterer's hair of the tan yards; they are either used separately or united in different proportions, according to the article required. These materials are first opened and sufficiently cleansed by passing them through the common devil, picker, or willy; after which, when required to be mixed, they are again passed through the same, or a similar machine; and are then ready for the next operation.

Plate XI., fig. 1, is a longitudinal section; and fig. 2, a plan view of the machinery or apparatus employed in making the ground work of the fabric.

A, is the feeding end of the machine, and the cylinder

B, are nearly the common construction of the most improved ordinary devil ; the feed rollers and apron being actuated in the usual ways, and the cylinder nearly resembling it, except that it has a greater number of steel teeth, amounting to about twelve thousand, in a cylinder of three feet wide upon the face, and three feet diameter.

One important feature, however, in which it differs, is, there is no grating to be used under this cylinder, but a large opening or box, with an end or stop at *a*, is provided for catching or retaining all the unopened locks of material or extraneous matter, which fall by gravity into it; and that the draft of air, produced by the revolution of the cylinder B, will only carry forward such light parts as are completely free and almost as open as the carding of such materials would produce. C, is a cylinder of large dimensions, say three feet in diameter, covered around its circumference with woven wire gauze or perforated metal, supported in one or two parts of its length by thin rims of metal, extending to its axle or arbor. The ends of this cylinder are closed, and the ends are just contained within the side linings of this part of the machine, which are the same distance apart as where it encloses the ends of the cylinder B.

It will be seen by the drawing, that only the upper half of the cylinder C, is exposed to the draft of the toothed cylinder B, and that the lower half his open for the escape of the air, after having deposited the fibrous materials upon it through the floor into the room D, below, which is constructed of latice-work, or any open material.

The surface of the perforated cylinder C, is made to revolve, in the direction of the arrow, at the rate of about five or six feet per minute; and the flow of the material having formed a bat of sufficient thickness, (which is governed by the amount of feed weighed and spread upon

the apron *b*,) when it has arrived at the two fluted rollers *c*, *c*, (the upper being weighted upon the lower,) is received between them, and passed onwards between the two other endless aprons *d*, *d*, *d*. These aprons are made of strong canvass, and the lower one revolves around the two end wooden rollers 1 and 8, and the upper one over the friction rollers *g*, *g*, and, consequently, over the intermediate ones 2, 3, 4, 5, 6, and 7; those marked 5, 6, and 7, are inclosed by the pan 9, for the purpose of admitting steam to the bat of hair (or mixture of hair and other materials) whilst between the aprons; and for which purpose, it is connected by a steam-cock and pipes, in communication with the boiler. *e*, *e*, *e*, *e*, are upright wooden beaters, with smooth rounded ends, supported in the frame-work *f*, *f*, and directly over the lower rollers 2 and 7. These beaters are divided into six or more several parts, as they extend across the machine, making in all about thirty-six;—they receive a small but quick perpendicular and falling motion by the tappet shafts *h*, *h*, *h*, which are geared, and revolve together, being connected with any covenient part of the machine. The quick alternate action of these beaters, aided by the steam and heat, applied in this way to the bat, occasion it to be properly hardened and united for producing a consolidated and partially felted sheet.

As the hardened or basoned bat, by the revolutions of these aprons and rollers, is liberated from between them at *i*, it is again received upon the hollow steam cylinders E, E, for the purpose of being thoroughly dried before arriving at the saturating process. These two cylinders are made of hollow cast-iron, and are in every way the same as the common paper drying cylinders, being supplied with steam at one end, and the condensed water taken off at the other, and furnished with stuffing-boxes, as shewn in the drawings. Around these two cylinders is passed an endless

apron *m, m,* of strong woollen or hair-cloth, moving in direction of the arrows, for the purpose of keeping the bat in contact with the heated cylinders, when the bat has arrived at *n, n*; it is now dried, and in a proper state for being saturated with the bituminous composition, which immediately takes place.

Two hollow cast-iron cylinders or rollers *v, v,* are mounted in proper bearings in the framing *w, w,* and are heated by means of iron heaters. The troughs or pans *x,* and *y,* contain the bituminous mixture, which is previously melted, and occasionally poured into these pans; it is afterwards kept in a fluid state by the radiant heat of the rollers. The lower roller being partially immersed in the composition in the pan x, carries up with it a sufficient quantity to saturate the under side or half of the sheet or bat. The composition in the upper pan flows into the chamber *w,* where the upper roller *v,* being in direct contact with the composition, conducts and saturates the upper side or half of the bat, as it passes under it. The upper heated roller is pressed upon the lower one by means of weighted levers; and as these rollers revolve, they not only squeeze or force the composition or bituminous mixture into and through the sheet or bat, but also press out all that may be superfluous, which again runs into the lower cistern or pan.

The bituminous and adhesive mixtures, commonly used by the patentee in this manufacture for roofing or covering buildings, are about one hundred and twelve pounds of mineral dry asphaltum to twenty pounds of liquid mineral tar.

For other things, one hundred and twelve pounds of mineral dry asphaltum to twenty pounds of common vegetable pitch, and twelve pounds of boiled linseed oil; or, instead of the oil, twenty pounds of liquid asphaltum or tar.

When vegetable pitch and tar only are used, one hundred and twelve pounds of pitch to thirty-five pounds of

tar, are necessary; but it is sometimes necessary to vary these proportions according to the quality of the materials.

The sheet being now completed, it is carried over the roller *z*, for the purpose of being cooled, when it descends upon the cutting table, where it is cut into sheets or pieces, as required.

The patentee does not claim, as novel, any of the separate and individual parts of the machinery; but he does claim the general arrangement and combination thereof, as applied to this and similar purposes, excepting the manufacture of felted cloths, (in respect of which, and for other machinery and improvements in the manufacture of woollens, he lately obtained letters patent,) and for producing a perpetual bat by the force of air, charged with any fibrous materials, being driven through a cylinder of woven wire gauze, or any perforated substance, (in contra-distinction to a former patent, by exhaustion,) as well as the mode of hardening or basoning, and drying such bat. And, finally, he claims the right of exclusively saturating the same with natural bitumens, and performing this in one continuous operation.—[*Inrolled in the Rolls Chapel Office, March,* 1840.]

To Gerard Ralston, *of Tokenhouse-yard, in the City of London, merchant, for improvements in rolling puddle balls, or other masses of iron,—being a communication.*—[Sealed 22nd February, 1840.]

These improvements in rolling puddle balls, or other masses of iron, consist in the employment of a peculiar construction of machine, for the purpose of compressing and rolling out, red hot balls, or masses of puddle iron,

into that state commonly called bloom, preparatory to the mass being rolled down into bars, or plates, or operated upon by tilt hammers.

Plate XI., fig. 3, represents a side elevation of the machine; and fig. 4, is a section taken vertically through the rolling cylinder. *a, a, a,* is the framework supporting the machinery, which framework may be of cast iron, or any other suitable material. *b, b,* is the rolling cylinder, turning upon an axle *c, c,* supported by the side frames; and *d, d,* are toothed wheels, affixed to the ends of the cylinder. *e,* is one of two pinions, or small wheels, upon a shaft *f,* also mounted upon the framework; which pinions or wheels, being driven by any convenient power, and taking into the teeth of the wheels *d, d,* cause the cylinder *b,* to revolve.

A segmental piece of iron, *g, g,* is firmly fixed to the framework, partially embracing the cylinder *b, b*; but in an excentric position to the periphery of the cylinder, as shewn in the section, fig. 4. Between this segment piece, and the cylinder, the ball, or mass of red hot puddle iron *h,* is passed, for the purpose of rolling and compressing it.

The large ball, or mass of iron, having been prepared in the puddling furnace in the ordinary way, it is to be introduced into the machine, as shewn at *h.* Rotary motion being given to the cylinder as described, the mass of iron will be carried forward between the cylinder *b,* and the segment piece *g,* by which it will be gradually compressed and reduced in its diameter, increasing in length until it is ultimately delivered out at bottom in the form of a roll, or long cylindrical piece, ready to be taken to the tilt hammers to be drawn out, or to the ordinary rollers, where it may be rolled into a bar or sheet.

It may be here remarked, that the mouth of the segment piece *g,* should be made nearly simicircular, which form it

partially retains for the purpose of compressing the mass on all sides during one or two rotations of the ball; but that its groove thence gradually widens out towards the end; which form is for the purpose of confining, or upsetting the ends of the mass of iron under operation.

The patentee claims, first:—The entire machine, as above arranged, for rolling or shaping puddle balls, or other masses of iron, preparatory to being rolled, or even drawn into a bar by the hammer; but he states, the outside casing might be brought farther down in front of the machine, as represented by the dotted line *n*, *n*, fig. 4; which arrangement improves its operation, giving a greater number of revolutions to the ball,—consequently reducing it more gradually.

Secondly:—He claims the plan of laying the above named machine in a horizontal position, when found better adapted to the situation where it is placed, and so altering it as to permit the upper flange, or edge, of the segment piece, to rise and fall, to admit of a larger or smaller ball. The weight of the said flange being so proportioned as to upset the ends of the ball, or bloom, sufficiently.

The same effect may be also produced by a cylinder, revolving within a stationary curved casing, as above described; or by a straight plate of iron, held stationary, in lieu of the above-described casing; while another, shaped like a wedge, is confined at a suitable distance apart, and moved by a crank; thus rolling a ball into a bloom each revolution of the said crank, the principle being one and the same.—[*Inrolled at the Petty Bag Office, August,* 1840.]

To Henry Elkington, *of Birmingham, in the county of Warwick, gentleman, for his invention of improvements in covering or coating, of certain metals with platina; and also improvements in gilding certain metals, and in apparatus used in such processes.*—[Sealed 17th February, 1837.]

These improvements apply to the coating of metals with platina and gold, which is a new mode of gilding, intended to supersede the old practice of employing an amalgam of mercury and gold.

Platina, in the first instance, is to be dissolved in nitro-muriatic acid. About ten ounces of nitric acid, and the same of muriatic acid, is required to dissolve one ounce of platina; and the combined acids must be kept at a gentle heat until the dissolution has been completely effected.

When this has been done, the liquid is to be evaporated to about half its quantity, and then three quarts of water added to it, with three ounces of bi-carbonate of soda, which is to be boiled until the soda is dissolved, and then one pound of bi-carbonate of potash added; after which the whole must be boiled together for half an hour.

A slip of brass, or copper, put into this solution, will experience little or no change in its appearance; but if a solution of gold be added to it, in proportions of from one to five pennyweights of gold to the quantity of the solution, then the gold and platina will attach themselves to the metal.

While this process is going on, the solution must be kept boiling, and the effect will be in proportion to the quantity of gold employed, and the continuance of the boiling. At first, the surface of the metal under operation, will appear of a bronze colour, but it will ultimately assume that of fine gold.

Another mode of gilding proposed, is by first coating the articles with platina in a metallic state, and then submitting them to immersion and boiling in the solution of gold. The effect will be the same nearly; the process only differing.

Under this head of the invention, the patentee claims the exclusive use of carbonate of potash, or soda, in solution with platina and gold, for the purpose of gilding the surfaces of metals.

An inferior mode of gilding is also mentioned, which is effected by boiling the articles in a solution of mercury, potash and gold; but this is only employed for articles of a less costly quality, and is subtsituted for an amalgam of mercury and gold, upon which it is an improvement, as a more ready, cheaper, and better mode of gilding.

The articles of jewellery thus gilt, may be coloured and lacquered, in the old way; that is, by the known processes, in which the patentee does not claim any novelty.

In order to preserve the platina, and gold, which may remain in solution after the gilding operation is done, it is proposed to evaporate the solution in a close vessel, by means of a vacuum, produced by an air pump. The particular form of this vessel, however, is unimportant, so long as it will effect the object proposed; which is to allow the metallic residuum to be preserved, and made capable of being employed for a future operation of gilding.—[*Inrolled in the Inrolment Office, August,* 1837.]

To THOMAS VAUX, *of Woodford, in the county of Essex, land-surveyor, for his improvements in tilling and fertilizing land.*—[Sealed 15th December, 1838.]

THIS invention is a mode of treating waste land, or poor common land, for the purpose of bringing it gradually into

a state of fertility. The plan proposed, is to peal off the turf from the surface of the land, in small patches, and then to dig or till those patches; which turf, being set up edgewise upon the cultivated pieces, may be burnt, and then trodden in, or by the rain washed down, and become good mould; to which mould also, is to be added the dung deposited by sheep or other cattle, whilst feeding upon the surface of the surrounding ground.

The manner of carrying this plan into effect, as proposed by the patentee, is to mark out the surface of the land, say ten acres, into squares of one foot area, and then to treat a patch of one foot in every four feet, in the way described, viz.—to peal its surface, and dig it to the depth of six or eight inches, then sow or plant, and set up the turf edgewise to dry; then allow the sheep or other cattle to pasture upon the other portions of the land, in order to supply the required dung, which is to be scraped, from time to time, into the tilled patches. By these means, the patentee proposes to provide good winter food for the cattle, and also a clean and dry surface for the sheep to tread and lie upon during the winter season.

From April to July, Swedish turnips, mangel wurzel, or cabbages, may be planted, one plant only in each tilled square foot; and in August, the sheep are to be turned in to pasture on the produce of the cultivated portions.

If a square of larger area, say two feet, is tilled, four plants may be put in each; or the land may be pealed in rows, and treated in the way described; and the new earth being spread over the old, the whole will in time become a rich fertile soil.—[*Inrolled in the Inrolment Office, June*, 1839.]

To Thomas Horne, *of Birmingham, in the county of Warwick, brass founder, for improvements in the manufacture of hinges.*—[Sealed 3rd September, 1840.]

These improvements in the manufacture of hinges, apply particularly to the process of forming hinges from rolled iron; and consist, in the first place, in an improved method of preparing the strips or plates of iron of which the hinges are to be made, and also in the application thereof to the making of hinges; that is, the "using up" or "working" of the same, or in other words, "cutting it up" for the manufacturing of hinges; and in the next place, in improvements in further preparing the knuckle or thinner part of the said rolled plate metal, or such parts of other plate metal so previously prepared, or cut into parts, and intended to be converted into hinges, so as to enable a better joint to be produced, when the two halves or wings of the hinge are fitted together; and, lastly, in an improved manner of producing the counter-sunk holes, intended to receive the heads of the screws, when the hinge is fastened in its required situation.

The patentee states, that in order to explain the first and second parts of the present improvements with clearness, he must refer to the specification of a former patent, granted to him by His late Majesty King William the Fourth, for certain improvements in the manufacture of hinges, bearing date the 24th of July, 1835, (see vol. VIII, page 226, of the present series of our Journal,) in the specification of which, it will be found that the "improvements consist in making hinges out of sheet metal, peculiarly prepared of unequal thicknesses, by means of rolling, drawing, stamping, or swaging, so that the parts which are used to form the knuckles or joints, shall be thinner than the parts

used to form the flaps or wings, of the hinges; and of turning over the said thinner parts of the metal into a rabbet, or against a shoulder, in the manner therein described."

In this specification, the groove, or thinner part of the metal, was described as being formed longitudinally, in the strips or plates of metal; that is to say, as regards iron in the direction of the "fibre" (as it is commonly called and known to iron workers and engineers) of the metal; and that when such iron was cut up (as described in my said specification) so as to form the two parts of a hinge, the fibres would still be in the same direction when the hinge was formed; whereas the first part of the present invention allows the fibres of the sheet metal to be placed in a direction across the hinge, or at right angles, or nearly so, with its length; and this is effected by forming the grooves, indentations, or thinner parts, which are to constitute the knuckles, or joints, at intervals across the piece, or plate, or strip of iron, which afterwards, being separated to form the two parts of the hinge, will have the fibres situated across each piece, whereby the metal can be turned round to produce the knuckle with greater ease and safety, and also to make a much stronger knuckle than when the fibres of the iron are placed longitudinally in the hinge. This will be better illustrated by reference to Plate V.;

Fig. 1, represents a portion of the prepared sheet iron, as described in the former specification, with the groove, or thinner part, which is to constitute the knuckle, formed in the same direction as the fibres of the metal, the course of the "fibre" being shewn by waved lines on the figures. Figs. 2 and 3, shew similar representations of portions of such plate metal, when separated, for the purpose of forming the two parts of the hinge; and figs. 4 and 5, are sections of the same, after the thinner parts have been turned over, to constitute the knuckle or joint; *a*, *a*, being

the thicker parts of the metal, or those intended to form the flaps or wings; and *b, b,* the thinner parts, or those to form the knuckles or joints. Fig. 6, shews a portion of the iron rolled, or otherwise prepared, according to the first part of these improvements; that is, with the grooves, or indentations, or thinner parts, made crosswise of the "fibres" of the metal, or at right angles, or nearly so, to the longitudinal direction of the rolled metal. Figs. 7 and 8, are representations of parts of the same, separated from the piece, in order to form the parts of a hinge; figs. 9 and 10, being sections of the same. Figs. 11 and 12, shewing the same after being turned over to form the knuckles, or joint; the waved, or broken lines in these figures, shewing, as in the former, the direction of the "fibre" of the metal. The dotted lines in fig. 6, shew the line of separation of the metal; and the black arrows the direction in which the thinner parts of the metal are bent, or turned over, to produce the knuckle or joint.

It will be seen, that by the present improvements, the direction of the fibres of the iron are placed at right angles, or nearly so, to the length of the hinge; that is, they will, by my present improvements, be bent round the pin of the hinge, in a direction crosswise to its axis; whereas they were, by the former method, placed longitudinally, or parallel with it, or nearly so.

The second part of the present improvements consist in giving a pressure to the thinner or knuckle part of the pieces of prepared metal, after they have been cut out from the sheet, for the purpose of further expanding these parts, so that, when properly operated upon, and finished by the workman, perfect or neat joints may be formed in the knuckles of the hinges.—This will be better explained by reference to fig. 13, which is a representation of one portion of a hinge, which has been operated upon by this

second process of pressure on the indented metal, or the like effect upon the same parts of plain sheet metal. *a*, is the part to form the wing, and *b*, the parts to form the knuckle.

It will be seen, that the sides of the parts *b*, *b*, of the piece which are intended to form the knuckle, are spread out or made wider by the additional pressure, so as to allow of a portion of the metal being removed by the workman, preparatory to the operation of "jointing;" which operation may be effected by the assistance of dies or stamping presses, or other suitable tools, as the manufacturer may think fit.

This operation of the further pressing may be performed (either separately or in conjunction with the hereinafter described process of counter-sinking the screw-holes,) on either or both sides of the hinge.

The third improvement being the making or counter-sinking of the screw-holes. It is effected either before or after the holes have been punched out by the ordinary process. The metal, when the counter-sinking is to be effected, after the screw-holes have been first punched out of the metal, (cold,) should be heated in any suitable furnace, and then subjected to pressure, under any suitable fly or stamping press, containing dies, having proper shaped faces, and one of them furnished with suitable raised conical parts formed thereon, so as to take into and act upon the several holes in the pieces or wings of the hinge.

Fig. 14, represents a vertical section of a pair of dies, furnished with suitable conical projections, for effecting this purpose. A, is the upper die or ram, which, in this instance, has only a flat face or surface; B, is the lower or fixed die; C, represents one of the raised conical pieces, fitted into or formed thereon; and D, the piece of iron prepared as hereinbefore described, that is,—with thicker and

thinner parts; and, consequently, the face of the bottom die has a step or lower part formed in it; but, in working with ordinary plate metal, this would not be required.

The action of the dies, when the two operations of pressing out the parts of the knuckles, and counter-sinking the holes, is performed at once, is as follows:—The piece of metal, after being made hot, is placed on the lower die, as shewn in the drawings, the conical pieces C, being opposite the previously punched holes. The upper die or ram A, is then made to descend, and, by its pressure, forces the piece of hinge metal upon all the raised conical studs at the same time; by the thinner or knuckle parts coming into contact, and under the pressure or operation of the parts *a*, *b*, of the two dies, they will be expanded or spread out, so as to take such a shape or figure as that shewn at *b*, *b*, in fig. 13. The pieces are to be removed quickly, and the dies kept cool by any convenient means. The surface of the conical holes may afterwards be finished off by any rotary tool, or punch, if required.

The patentee claims, firstly,—The improved method of preparing the strips or plates of iron for hinges, so that the *fibres* of the metal, as they are commonly termed, shall be laid or placed crosswise of the hinge; secondly,—The expanding or spreading out of those parts which form the knuckle or joint of hinges, which have been previously cut, parted, or separated, by means of any description of press and appropriate tools, in order that there may be sufficient width of metal to enable the workman to form a close and neat or perfect joint; and lastly,—The operation of previously counter-sinking, or first preparing the screw-holes by means of coned dies, as herein described, instead of altogether cutting out those parts, which admit the heads of the screws, by cutting-tools or drills, (or what in the

trade is termed "counter-sinks,") as generally used for that purpose.—[*Inrolled in the Rolls Chapel Office, March,* 1841.]

To Richard Whytock, *of Edinburgh, in the Kingdom of Scotland, manufacturer, and* George Clink, *of the same place, colour maker, for their invention of further improvements in the process and apparatus for the production of regular figures or patterns in carpets, or other fabrics, in relation to which a patent was granted to the said Richard Whytock, on the* 8*th of September,* 1832*; and generally, in the mode of producing party colours on yarns, or threads of worsted, cotton, silk, and other fibrous substances.*—[Sealed 1st March, 1839.]

This invention consists chiefly in the substitution of a dyeing process, in lieu of the printing process, described in the specification of Richard Whytock, (see Vol. XIII of our Journal, page 387.)

The present invention, like the former, is an improved method of colouring the threads, or yarns, which are to be used in weaving certain fabrics, with a succession of different colours, applied at different portions of the length of each yarn, according to such a peculiarly regulated order of succession of colours, as that after the yarns (so rendered-party coloured) being suitably arranged in a simple loom, such as is commonly used for weaving plain cloth, without any figured pattern thereon—and after the said party-coloured yarns have been so woven, particularly into such fabrics as velvets, velvet pile, and Brussels or Wilton carpets, by the ordinary manipulations of plain weaving in such a simple loom,—the fabric so formed, by

plain weaving, shall exhibit the appearance of a pattern, or design, in divers colours, by virtue of the variegated colours which were previously applied by our said improved method on the yarns, at different portions of the length of each yarn, according to a suitable and peculiarly regulated order of succession of colours, as aforesaid.

This being the case that the inventions are in so far similar, the patentees consider it necessary, before proceeding to describe the present invention, as referring to the former specification of Richard Whytock, that the nature and object of the present improvements may be more apparent.

It is stated, in the former specification, that "whereas certain yarns, which are intended for weaving patterned fabrics by plain weaving, have been heretofore rendered party-coloured by tying, in knots, parts of the hanks or skeins of yarns, in order to preserve certain parts of the yarns free of colour, when the other parts are coloured by submitting the whole hanks or skeins to a dyeing process; and also, by a more recent process, such yarns have been rendered party-coloured by printing them whilst they are in hanks or skeins; and the yarns, so rendered party-coloured, whether by dyeing or by printing, are afterwards arranged in the loom, so as to give to the fabric, which is woven therein, (by plain weaving,) the appearance of certain irregular and ill-defined patterns, in single or party-colours, such as clouded, speckled, mottled, marbled, and spotted patterns.

I wish it to be understood, that my improved method is formed on the same principle, and by virtue of certain mechanical arrangements for rendering the yarns party colored with a suitable succession of colours, and after the same are suitably arranged in the loom, (certain precautionary measures, hereinafter described, being used, in order to keep

up the said suitable arrangement unchanged during the process of weaving,) my invention will facilitate the production of regular figures or patterns, which will correspond with sufficient accuracy, to a previous and intended design; such accuracy and regularity has not however been hitherto obtained by the ordinary mode of dyeing or printing the yarns in hanks.

And whereas, certain schemes have been proposed by Messrs. Schwabe, Woodcroft, and others, for printing the yarns, by means of metal cylinders, with engraved surfaces, when such yarns have been made into warps,—I wish it to be understood, that according to my improved method, I do not print on the yarns when they are arranged in a warp, nor do I make use of engraved surfaces or carved blocks, with any feigned design which bears the least resemblance to the figures which will be presented by the woven fabric, but, with the same mechanical combination and printing implements, which I use for rendering yarns party-coloured, for the production of one kind of regular figures on the woven fabrics—I can also render yarns party-coloured, for the production of an unlimited variety of different regular figures, by only varying the order whereby I apply the different colours to the yarns;—and, according to my invention, the warp for weaving is formed after the yarns are party-coloured,—whereas, in Mr. Woodcroft's, or Mr. Scwhabe's method, the warp is formed first, and the printing done afterwards.

This distinction being made, the patentee goes on to describe the method of printing the yarns; so far, therefore, the original invention of Richard Whytock agrees in principle with the present; only, as before stated, instead of the printing process, by which the yarns or thread were rendered party-coloured in the former, the present patentees propose to substitute a dyeing process.

The first operation is to cover a cylinder or an open reel with one or more threads of worsted or other fibrous material, according as the intended fabric may require, with a succession of convolutions, regularly wound upon the cylinder or reel, by means of a traverse or guide, on the principle of those used in filling bobbins of sewing cotton, &c., so as to lay the successive turns of the thread, side by side, upon its surface. When the reel is filled or covered with the required breadth of yarn, they proceed to secure these convolutions of the yarn, in the same regular order in which they are laid, by means of two wooden clasps, which are closed upon the threads at right angles, with and at opposite sides of the reel. The reel is then partially folded down, by drawing the clasps in opposite directions, to allow the coil to be removed, when it is laid flat, that it may be subjected to the dyeing process; that is,—supposing both sides of the coil are to receive the same colours, in the same order; otherwise the coil is not laid double, for it may be coloured either as an opening or as a closed one.—We shall at present suppose the latter.—

When the coil has been re-moved from the reel, the clasps, (which are intended only to keep the turns of the threads in their regular order,) remain until smaller clasps of thin metal are placed upon the coil, to separate the portions which are to be dyed of one colour, from those that are to receive a different colour.

The patentees have represented in several figures, an apparatus, by means of which the dyeing process is effected, but they do not confine themselves thereto.—They say, in conclusion, " we should state, that we have given certain definite and particular descriptions of the various parts composing our said invention, as regards dimensions, and the materials of which the various parts should, in our judgment, consist,—but we reserve to ourselves, notwith-

standing such description, the right to compose the various component parts thereof, of different metals and materials, and to adopt other and different sizes of apparatus, as circumstances may require or render more desirable.—And we do hereby claim as new, and as of our invention:—

First,—the mode of dyeing threads or coils of yarn, by our improved plan of cutting off the communication between the various parts thereof, and applying dyeing liquids to it while such connection is cut off, in whatever way this may be effected; whether by our method of using partitions and straps, made of copper, or any other contrivance, by which the connection may be cut off.

Secondly,—we claim the mode of forming receptacles, pans, or vessels, composed of straps and partitions of copper, which, when put together, form water-tight receptacles, as well for containing the yarn or threads to be dyed, as for the dyeing liquids to be used therein.—And, lastly, we claim the contrivance of having a longitudinal metal plate, with slips of metal soldered or otherwise fixed on it, at right angles, to its length, for the purpose of forming vessels or pans for containing dyeing liquids; and for the reception of the slips of metal for cutting off the communication between such liquids, according to any previously determined pattern, whether such slips of metal be adjusted to their places by screws, weights, levers, springs, or otherwise;—but we disclaim the use of the steam apparatus, being aware that it is not new, except for its application to the purposes of our said invention; nor do we claim the use of the reel or cylinder, neither of these being new,—but only for the purposes aforesaid. And we hereby declare, that we reserve to ourselves the power of dyeing yarns by our aforesaid improved mode, as well without the aid of steam as with it.—And, lastly, we declare, that although we have, in this our specification, referred to certain

parts of the specification of the patent granted to the said Richard Whytock, on the 8th day of September, 1832, yet this was only for the purpose of illustrating our invention, and such reference is not meant by us to be understood as forming any part of our invention, beyond illustration.—[*Inrolled in the Rolls Chapel Office, September*, 1839.]

To John Heaton Hall, *of Doncaster, in the county of York, chemist, for improvements in preserving and rendering woollen and other fabrics and leather water-proof.*—[Sealed 5th December, 1839.]

This invention consists in applying certain chemical materials, in the manner hereafter described, to such articles as are required to be preserved or water-proofed.

When articles require to be water-proofed, dissolve two ounces of pulverized alum in one pint of distilled water; then take one ounce of the dry white lead of commerce, and rub it well down in a pint of pure water; and when well mixed, add the two solutions together, and the undissolved matter subsides; after which, draw off the supernatant liquid, and pass the cloth, or other article to be preserved, through it. Or the following chemical combination may be employed:—

One ounce of dry white lead of commerce, one ounce of pounded alum,—rub the white lead down in half a pint of water, and dissolve the alum in another half-pint, and add thereto two fluid drachms of acetic acid,—then mix the white lead and water with the dissolved alum and acetic acid; then allow the precipitate to subside, and draw off the supernatant liquor, and pass the cloth or other article through it directly.

After the materials to be preserved, have been submitted to either of the above preparations, they must be passed through the following solution, viz., half a pound of quick lime mixed with one gallon and a half of distilled water; and when this has been done, and the fabric or leather partially dried, it must be pressed through a solution made of two ounces of clean picked Irish moss, boiled in three gallons of pure water, and boiled down until the quantity becomes reduced to two gallons; this must be strained through a fine flannel bag, and two gallons more of pure water added.

When the fabric has been passed through the above solution, it must be pressed, in order to prevent too much of the mucilaginous matter from remaining, but only a sufficient quantity to fix the water-proofing material.

The solution, for preserving fabrics and leather, is made in the following manner:—Take one ounce and two drachms of camphor, eight ounces of crude arsenic reduced to powder, eight ounces of white soap, three ounces of salt of tartar, and one ounce of prepared chalk pulverised.

In order to mix these substances, cut the soap into slices and smelt it with a little water, in a pot, over a slow fire, stirring it frequently with a wooden spoon; and, when melted, add the salt of tartar, and pulverised chalk; then take it off the fire and put in the arsenic: and add, lastly, the camphor, in the state of a fine powder.

In order to make this preparation sufficiently liquid for use, one gallon of pure rain, or distilled water, must be added.

The patentee says, that he sometimes mixes one ounce of the preserving preparation with one gallon of water, and adds thereto one pint of either of the water-proofing solutions above mentioned; and by submitting the fabric, or leather, to the mixed solution, he water-proofs and preserves at the same time.

When the first preparation is used in its simple state, it is not necessary to use the lime-water; and when operating on thin fabrics, they should be partially dried before passing them through the solution of lime.

In conclusion, the patentee states, that although he has been particular in stating exact quantities for the above preparations, yet he does not confine himself thereto; and when preserving leather, or fabrics, the camphor may be omitted, if the smell is objected to; and also, if fabrics of extra thickness are to be operated upon, the mixtures must be made stronger than those above given.

After the fabrics have been submitted to the above-mentioned preparations, they are to be dressed and pressed, for the market, in the ordinary manner, according to the particular fabric that has been operated upon.—[*Inrolled in the Inrolment Office, June,* 1840.]

To WILLIAM STONE, *of Winsley, in the parish of Bradford, in the county of Wilts, gent., for his invention of improvements in the manufacture of wine.*—[Sealed 21st January, 1840.]

THIS invention is for making wine from the stems or stalks of rhubarb; and the method pursued by the patentee, in manufacturing the same, is described in the following manner:—The green stalks or stems of the rhubarb having attained their full size, (which will generally be about the month of May,) they are plucked, and the leaves stripped off, and thrown away as useless; they are then bruised in a mortar, and reduced to a pulp, which is put into a vat or tub, adding to every five pounds of pulp one gallon of cold spring water. This is allowed to remain for three days,

taking care to stir it four times a day; on the fourth day the pulp should be pressed in the ordinary manner, and the liquor strained off, and placed in an open tub or vat; and to every gallon of the liquor add three pounds of white loaf sugar, stirring it until the sugar becomes perfectly dissolved. It should then be left alone, and in five or six days the fermentation will begin to subside, and a crust or head formed; this should either be skimmed off or the liquor drawn from it, just when the head begins to crack or separate; after which, it is to be put into the cask, but not stopped down; and if it begins to ferment in the cask, it must be racked off into another, and, in about a fortnight, it may be stopped down and allowed to remain until the following March, when it may be again racked, and the cask stopped down; but, if from any slight fermentation, the wine should have lost any of its sweetness, a sufficient quantity of loaf sugar should be added to sweeten it; after which, the cask must be again stopped, and care taken that it is always full, and in a month or six weeks the wine will be fit to bottle, and in the summer to drink; but the wine will be considerably improved by being kept a year or two in the cask.

The plant, about the latter end of August, produces another crop, and a further quantity of wine may be made by pursuing the same process.

The patentee says, in conclusion,—"Having now described the nature of my invention, I would remark, that although I have minutely described the process, as pursued by me, yet I do not intend to confine myself to the precise means. And I have found, that by using the before-described process, and applying one pound and a half of white loaf sugar, instead of three pounds, to every gallon of liquor, I produce a very agreeable wine; and by using two pounds of sugar, instead of three, and employing the same process, a very good wine will be the result; there-

fore I do not confine myself to the exact quantity of sugar, or other of the ingredients; but I claim the mode, herein-before described, of manufacturing wine by the application of the product from the stems or stalks of the plant called rhubarb, as above described.—[*Inrolled in the Inrolment Office, July*, 1840.]

Scientific Adjudication.

WOODCROFT'S PETITION FOR THE EXTENSION OF A PATENT RIGHT.

(Continued from page 214, Vol. XVIII.)

Is that done purposely?—Yes, that is caused by more of the threads of the warp being thrown up.

Could such a shawl have been printed to have an effect like that in the old mode of printing upon silk?—I suppose not, but I am not aware of what is meant by the old mode of printing.

I mean before Mr. Bennett Woodcroft's process, could that have been printed upon silk, could it have had an effect as fine as it has, being printed upon yarns?—I think not, but I have not tried. Here is the same bouquet of flowers at the other side. I do not know whether one is more perfect than the other.

Lord Brougham: Is that printed by the same process?—I believe it is done by Mr. Woodcroft.

Mr. Justice Erskine: Is that French or English?—English; my own manufacture. I do not present it as any thing very splendid, but as one that I laid aside to bring with me.

Mr. Teed: What effect would the throwing open the patent produce upon the silk trade?—I should give there my opinion. My opinion is, that it would open a very important era in the trade, and that is very desirable. When it first commenced, it was in a comparatively imperfect state, as this first pattern will manifestly shew; and it is my opinion that it should be worked by persons who have devoted a certain portion of attention to fancy goods; that they should devote skill and capital to bring it to perfection, and of course, if it were thrown open to general competition, (this is my opinion) persons would not be induced to expend skill and capital upon it. This perfect shawl has several other small bouquets upon it, but the blocks alone for that cost, I think, nearly £45. I merely speak of this as an illustration, but other blocks of course cost money; a good deal must be expended in bringing this thing to perfection, and unless there is something like protection, persons will not be induced to devote their skill and capital to this object.

It will let in cheaper and inferior descriptions of goods?—Yes, the French

are paying a very high premium for their patterns, therefore they go on continually to improve.

Would it affect the demand for English silks, do you imagine?—It depends upon the purchasers; there are some would go for excellency, others for quantity. My opinion is, that for a time, at all events, this should be brought to perfection; and, of course, as I said before, that could only be done by giving some advantage to those who are willing to undertake it; others would go for quantity, and get as cheap as they could.

Messrs. Woodcroft have printed for you?—Yes, they have.

And what they have printed you have woven?—Yes, to a considerable extent.

Are the prices they have charged fair and reasonable?—Yes, indeed, for the description of goods they generally make. I should not much mind the price, because I consider it purely a fancy article.

The price is not such as would be likely to injure the sale of the printing? —No, I think not.

What is the price?—For printing for one colour, 12s. per lb.; for two colours, 17s. per lb. (I hope I am correct in the amount); for three colours, 20s. per lb.; and 2s. per lb. for every additional colour. That is the price of their printing it entirely, and they let out a license for 3s. per lb., independently of the number of colours.

What quantity of silk would be produced in a pound of yarn?—Something would depend upon the quantity of it.

How much a yard would the payment of 3s. per lb. upon printing warp be?—But a trifle upon such goods as this, for instance; probably about 1¼d. a yard, the mere license, and of course the amount per yard would depend entirely upon the number of colours used.

That is the expense of colours, and the time and attention given to it?—Yes; for instance, here is a pattern with a great number of colours; I do not know how many, but probably there may be seven, or eight, or nine colours here.

That would require seven, or eight, or nine blocks, and seven, or eight, or nine applications?—Yes, and upon this there would be paid on the scale I have stated, 12s. for the first, 17s. for two, 20s. for three, and two shillings a colour after.

Those prices you think fair and reasonable?—Yes.

Is that one of yours? (a pattern being shown to the witness.)—Yes, this was printed and woven without the picks across to keep the warp in the place; the pattern has just to be laid out.

In cross-examination of Mr. Hall, Mr. Le Mare stated that the price he had named was independent of the 3s. per lb. for the license. Within the last few months he had commenced printing, and had taken out a license from Mr. Woodcroft. He was aware that the patent expired on the 27th of March, but could not say whether his partners had made an arrangement for the license for an extended term.

[The further cross-examination of Mr. Le Mare had reference to the mode of printing and the use of cross picks, &c. He was led to adopt this kind of work by the knowledge that the French were about to introduce it into this market.]

Mr. Henry Winkworth, silk manufacturer, employed Mr. Woodcroft to print a pattern warp of silk in 1839, and has subsequently employed him.

By Mr. Teed: What induced you to have the yarn printed in 1839? Had you seen or heard of it before?—I was induced to do it from seeing the French patterns, a description of cloth which I thought was likely to sell extensively; and I heard that Mr. Woodcroft, who had formerly printed cotton yarns for that same purpose, was printing silk, and I applied to him to do it for me.

Do you conceive the principle of printing upon yarns very useful or valuable.—I think it is very valuable. It enables us to produce effects upon silks which before we were quite incapable of doing.

Does it enable you to compete with foreign markets?—Yes, with foreigners.

Have the printed silks which you have been enabled to produce, been favourites with the public?—They have been much so.

Have they superseded French patterns?—I cannot say that, but they have been sold together.

Are you acquainted with the mode of printing; how the printing is accomplished?—Not much. I have seen them printing at Mr. Woodcroft's, but am not a printer.

Do you know the nature of his patent and specifications for printing upon yarns?—I have read it cursorily.

Do you know whether the object of it can be accomplished according to his method?—Yes.

Can silk yarn be printed upon merely the yarn distended the ordinary way from the beam?—It cannot be.

According to the patent?—Yes.

Is it usual, or absolutely necessary to have the weft shot across?—In all difficult patterns it is necessary.

Is that necessary for the purpose of weaving or washing?—For both.

Is it necessary if you have a careful weaver?—I think it is.

Had you ever heard of any one printing upon yarns before you heard of Mr. Bennett Woodcroft's patent?—I never had.

The invention you think very valuable as a commercial question?—I do.

What effect do you imagine would be produced upon the silk trade if the patent were thrown open?—I think it might produce so large an amount of competition as to render the article without value, and therefore to destroy the incitement to produce it.

Lord Brougham, addressing the opposer's counsel, observed, "Then we had better make the extension *perpetual.*"

You think that articles so beautiful would not be produced?—I think not.

If inferior articles are produced upon silk, what effect does that have?—I think it destroys them. Silk being an article of luxury, if they become common, the essence of luxury would be destroyed, which is peculiarity or exclusiveness.

Do you know the prices that Mr. Woodcroft charges for license for printing?—Yes, 3s. a pound.

Is that a fair price?—I think it is.

Has that had any effect in encouraging the demand?—I do not think it has.

Cross-examined by Mr. Hill: Are you a licensee of Mr. Woodcroft?—I am no licensee; I employ a person under a verbal agreement.

You protect the interests of the public by taking a portion of this monopoly upon yourself. These goods are made in France, are they not?—They are.

By how many manufacturers are they made in France?—I am not sufficiently acquainted to know.

Twenty or thirty?—I do not know.

There is no monopoly in France?—No.

We heard from the last witness that the French are our superiors in this manufacture, among others?—I think they are.

When is the earliest time that you saw the French goods in this country? —About five years ago.

Mr. Justice Bosanquet: Are the French goods Lyons manufacture?—Yes, they are, principally.

Mr. John Farey, examined by Mr. Teed: You are a civil engineer?—Yes, I am.

Are you acquainted with Mr. Bennett Woodcroft's process for printing? —I am acquainted with the specification, and I have seen the process.

Can you say whether the object can be accomplished according to the specification?—I take the object to be expressed in the title of the patent. That object can be accomplished by the process described in the specification, or rather by the directions given in the specifications.

Will you state to their lordships what you consider the advantage of the patent over the old mode of printing upon silk or cotton?—Am I to speak with relation to the old mode of printing woven cloth?—Yes.—This invention consists, then, in printing the yarns which are to constitute the warp of the cloth previous to weaving those warps into cloth, in contradistinction to the same process of printing being applied to them after it is woven into cloth; whereby, in the ordinary process, both the warp and the weft of the cloth are printed equally. In this process the warp only is printed. The advantages of that are that the printing materials, the colouring matter, passes completely through the yarns, so that they are equally printed on each side, and that the cloth which is produced has the same appearance on both sides. Another advantage is a peculiarity of colour: that is given by the circumstance that the colour printed on the warp is interchanged, blended with the colour exhibited by the weft. Every coloured portion of the finished cloth which is woven by this process consists of a compound of the colour that has been printed upon the warp with the colour which is contained in the weft. That gives it a tint of colour that is very distinct in its character from the preceding, and, if examined with a microscope, the reason is apparent, viz., that it is a kind of basket work, whereof each division or cheque is one colour, and the other intermediate division of another colour; and it is the skill of the weaver to make those colours harmonize together, so that it produces a bloom, as the ladies call it. The nearest effect to it is the staining of glass. There is another effect: it softens the outline that is given. And another great advantage is a matter of trade; a very great advantage is, that the warps after being printed are susceptible of subdivision and re-arrangement; so that from the same copper-plate or block, which in cloth must of necessity be a representative of that block or engraved plate, you may, when the warp is printed, first have that warp subdivided into breadths, re-arranged in a new order, or interchanged with breadths from another distinct pattern, or with breadths put in from plain woven cloth. Therefore it gives the means of diversifying the patterns which are obtained or procured by blocks and engraved surfaces. That, as a matter of trade, is an immense advantage, because the skill and fancy of the weaver is brought to be available, superadded upon the skill and fancy of the printer or engraver, which, by the ordinary system, it is not, but must end with the printer. Whatever the printer designs that must go to the public, except there be an alteration of the design, and a new engraving, at a very great expense. In this plan of printing the warps after the printer has exercised his ingenuity, the weaver has an opportunity of superadding upon that his taste, skill, and ingenuity, to diversify and vary patterns to a very and almost unlimited extent, with the addition of a superior appearance from the bloom that the colour derives, as I have before stated, from the mixture of the colour printed upon the warp, and the colour that is inherent by dyeing in the weft.

Do you know the style of printing among the French?—I have seen articles of this description brought from France called chenée.

Is this calculated to enter into competition with that?—As well as we are able to compete with the French at all in articles of design, I think it is a great accession.

We could not have competed with them by printing upon finished silk cloth?—All the printing that could be done upon silk cloth has not the same effect in its appearance, for it is more complete, more decided. This has a softness in it which, for a particular class of patterns, gives a different effect, and which ladies who wear, should very greatly esteem.

This is accomplished by the ordinary printing apparatus to be used for printing yarns?—There is no difference in the apparatus, they go through a process in submitting the yarn to printing, which differs from the process used in submitting the cloth, but it is done at a like machine.

But the printing is according to the specification?—It is as printing is always practised with calicoes, without other differences than those which are described in the specification, for causing the yarns of the warp to pass into the machine in a state of regularity, and also after they have, in consequence of the printing, become gummed together so as to adhere, they are then disunited by raising every alternate thread and separating them from the others.

That is in the specification?—The specification describes that.

Cross-examined by Mr. Hill: Will you inform me what is new in Mr. Woodcroft's patent—printing by cylinders is not new?—No, certainly not.

Printing by blocks is not new?—No; I have stated that the same apparatus is used. There is another class of printing which has become extinct—printing from flat surfaces engraved copper-plates with a machine, resembling in its general character that used for painting or backs.

The printing of yarn, of which shawls were made, was done before Mr. Woodcroft's time, was it not?—I am not aware of that—I am not aware of the printing of warps before, but I should state that it was a common practice to produce an effect by partially dyeing yarns by tying knots, which has the same advantage in colouring, but is not susceptible of defining patterns.

It is very much used in the carpet trade?—The carpet trade is the great use for that. I have seen it used in ribbons.

Now, taking out that which is old, just tell me that which is new in Mr. Woodcroft's patent?—I take it to be new the printing of yarns, which are afterwards to be woven into cloth, those yarns being used chiefly for warp, but occasionally for weft, if that is desirable.

Then I understand you that you take the principle to be to print yarns, which are afterwards to be woven into cloth, whatever materials the yarn may be made of?—Yes.

Whether printed by cylinder or block?—Yes; and whether that is to be used for warp, or weft, or cloth.

Then it is printing yarns in the widest sense?—It is.

You have described to my lords that by the specification and drawings, it appears that after the yarn is printed, the threads are taken, some of them above the roller, and some under the roller?—Yes.

So as to be separated?—Yes, that separation being what is made in all weaving of warps, called the lease. It is a separation by every alternate thread being depressed, the intermediate thread being elevated, so that it is divided into two portions, and that is afterwards secured by putting in a string to keep it so that it may be found in any subsequent process in that state.

Can the cross picks be used when that operation is performed?--That has no reference to the cross picks.

If you use cross picks, and you turn on the machine in the way described in the specification, will that part of the machine work which separates the threads?—Cross picks can be used in the cylinder machine—the cylinder machine has the same reeds that the weaver uses in his loom, they keep the threads at their respective distances, so as to form one plane in the same manner as cloth would form a plane.

Can cross picks be used in any of the machines described and figured in this specification?—Not in the machines figured, or perhaps described, but block printing is mentioned, which was a known art, and not commonly called "machines;" they are called "apparatus;" there being no moving power; cross picks might then be used because no reeds are used, a reed answering the same purpose as a cross pick.

Then the very drawing, and the very machine that is described by the inventor, renders it neccessary that you should give up the advantage of cross-picks? It is mentioned that you may use block printing, which is a known art.

Is there a word about cross-picks? No.

Then am I right that that very machine described in the specification renders it necessary that the person using it should give up the advantage of cross-picks? Yes; the mention of block printing being sufficient as a known art of long standing, and perfectly understood, the machine for printing being more complicated, it seemed to be more necessary to deseribe it, but it is equally well known in Manchester, though not elsewhere.

When did you see those French goods first, or known of their being introduced into this country? I was not aware how they were introduced, but they were shewn to me by some ladies of my family who had purchased them.

How long ago? Four years ago; and I examined them without a glass and saw they had a different effect, and my curiosity was excited.

You knew they were not printed in cloth? No. I supposed they had undergone some process which discharged a portion of the colour. If I had examined them with a glass at the time my curiosity was first excited, I must have found the fact I have here stated, that the weft shewed its colour conjointly with the warp and produced the effect, but not having examined them with a glass, my first notion was that they had a portion of the colour. There was less density; it was more like painted glass.

Lord Brougham: There is nothing new in this machinery? Nothing new, except the application of the reed, which was never used in a printing machine before. That would be inapplicable to cloth. There are several of them in the machine.

Which would include the use of the cross-pick? Yes, the cross-pick being for the old system of block printing; in the one the block is brought to the cloth, and in the other the cloth is brought to the impression. And, after it is partially coloured, the threads are all broken regularly, to destroy the adhesion, which would be pernicious; aud that is the formation of the lease which all the weavers require in the warp, to put the threads through it, that it may not get deranged; therefore all those may be said to be portions of the loom which are brought for the first time to be placed in juxta-position with the parts of the printing machine.

Mr. Hill: Will your lordship ask him whether the reed, as part of the loom, is not of known antiquity? Quite so. I have used the term "reed" as being best understood; but technically speaking, it is not a reed, but a shute, which is so like it that your lordships would not find a difference; but one is for the purpose of keeping it divided, and the other to beat it up with great force.

And each being very old? Yes.

David Roberts, a weaver, who had been employed in dressing warps to be printed on, was examined at some length as to the possibility of printing warps without cross picks. He stated that he had known them done without as well as with, but he thought it would answer better, provided it had cross picks.

Mr. Le Mare called again, examined by Lord Brougham: What was it you understood from Mr. Bennett Woodcroft had been done in France, thirteen and a half years before it had been done in this country, this description of work in chenée printing upon the yarn? Yes.

When did he tell you that? In the early part of last year.

Did he represent that it was his invention? The impression I received was that he had permitted the French to use it, that he had given them the patent right, or had licensed, or, in some way, that he claimed the origination of this invention.

In France as well as here? Yes; that is the impression I received. If I were allowed to give what I conceive the history of this, I should say that whoever claims the origination of this, though it might have been introduced by Mr. Woodcroft in 1829, yet it was not till the French took it up and worked it successfully, and began to introduce the goods here, that we felt it desirable to come into the trade, because not only have the French a great deal of taste, but there is a very decided predilection here for French goods.

Mr. Robert Gardner stated, that there was such a demand for the ginghams made from these yarns in 1830 - 31 - 32, that they could not be supplied fast enough. It was a valuable invention, as it introduced a new style. When the duty was taken off prints, the demand for ginghams ceased. He believed that there could not be much profit from the invention.

The Council Room was cleared. After some time the counsel and parties were again called in.

Lord Brougham: Their lordships do not think that in this case they are entitled to put the power of the act in force to the extent of granting a prolongation of the patent. They do not consider that, under all the circumstances of the case, sufficient proof has been given to them of merit in the patent which has been granted, to entitle them to extend it.

List of Patents

Granted by the French Government from the 1st of April to the 30th of June, 1840.

PATENTS FOR FIFTEEN YEARS.

To Kulback and Fichet, represented in Paris by M. Perpigna, Advocate of the French and Foreign Office for Patents, Rue Choiseul, 2 ter., for a gas regulator.

Kirk and Wright, of Caen, represented in Paris by M. Perpigna, advocate, for a rotary steam-engine.

Romagny, represented in Paris by M. Perpigna, advocate, for improvements in the combing of wool.

Davies, of Manchester, represented in Paris by M. Perpigna, advocate, for machines for manufacturing screws and screw-bolts.

Beerbolm, represented in Paris by M. Perpigna, advocate, for an improved weighing machine.

Stedman, represented in Paris by M. Perpigna, advocate, for improved paddle wheels.

Maudslay, represented in Paris by M. Perpigna, advocate, for improved steam-engines for navigation.

Brocard, of Marteau, represented in Paris by M. Perpigna, advocate, for a process for the cure of rheumatism.

Arribert, represented in Paris by M. Perpigna, advocate, for an improved oven for baking bread.

Verpilleux, represented in Paris by M. Perpigna, advocate, for an improved steam boat.

Goulard, represented in Paris by M. Perpigna, advocate, for an improved apparatus for cutting off the heads or caps of glass cylinders.

Caucanas, of Paris, for an hydraulic machine.

Tardif, of Paris, for manufacturing of spectacles.

Regard, of Beauthene, for twisting of silk.

Canning, of Paris, for refining of salt.

Channe, Sen., of Montpellier, for an improved rail-road.

Rogers, of London, for an improved fuel and means of lighting.

Legros and Pallandre, of Lyons, for bread, called *horse bread.*

Boistel, of Toulouse, for baking of pottery.

Dufour, Marseilles, for an improved plough.

Richard Fourneyron and Arnoud, of St. Etienne, for an improved flour mill.

Vergniais, of Lyons, for a rotary steam-engine.

Elemandot and Maïs, of Boulogne new Paris, for manufacturing of crystal glass.

Sassias, of Paris, for an excavating machine.

Chatron, of Paris, for manufacturing of horse-shoes.

Plantie and Co. of Bayonne, for the grinding and decantation of substances, used in the manufacturing of porcelaine.

Camion and Brothers, of Court, (Ardennes,) for a machine for making hinges.

Doens, of Paris, for a mechanical application of the human strength.

Denière, of Paris, for manufacturing of spoons and forks.

Vourgère, of Paris, for manufacturing marbles, agates, jasper, &c.

Pottet, of Paris, for percussion fire-arms.

Achet Sanford Varall, of Paris, and Odens, of Pommeuse, for cleansing of refuse cotton, flax, &c.

Gentet Brothers, of Lons le Saulnier, for a fire-engine

Brunier, of Paris, for a rotary steam-engine.

Bernard, of Valenciennes, for an improved wood pavement.

Mondot de Lagorce, of Lyons, for a new steam boat.

Robertson, of Paris, for improved cartouches.

Andraud and Tessié de Motay, of Paris, for power derived from compressed air.

Cotelle, of the Batignolles, for a process for unsalting and purifying sea water.

Blanc and de Nouvion, of Paris, for the decomposition of chlorure of sodium, for the manufacturing of glass, and of carbonate of soda.

Madame Bisso, of Paris, for a weaving loom for manufacturing, mechanically, circular fabrics without a seam.

Droinet, of Rheims, for means of directing the smoke of locomotives.

Dumouthier, of Houdan, for an improved breech for fire-arms.

Chameroy, of Paris, for improvements on rail-roads.

Buffard, of Lyons, for a machine for warping and folding at the same time.

De Thierry, of Paris, for a new system of paving.

Houdinet, of Rheims, for improvements in carriages.

Gourlier, of Belleville, for a gas meter.

George, of Paris, for a new method of traction, applicable to carriages, waggons, &c.

Robertson, of London, for an electro-magnetic machine.

Zuber and Co., of Rixheim, for improvements in paper-making.

Stirrat, of Poisly, (Scotland,) for an hydraulic machine.

Vaucher, of Paris, for a process for dissolving glue, &c.

Charpentier Maizière Emy Foullon, of Paris, for an apparatus for preventing the breaking of glass bottles, by properly regulating the fermentation of sparkling wines.

Bossens, jun., of Sauve, (Gard,) for a machine for making knit waistcoats, petticoats, &c.

Carteron and Turk, of Màcon, for machinery, called *Sthenofluide.*

Madame de Wendel, of Hayemge, (Moselle,) for improvements in the puddling of iron.

Guillemin Brothers, of Paris, for new wafers.

Delvigne, of Paris, for improved detonating bullets.

Courtois, of Paris, for improvements in glazing.

Leroux, of Verneuil, for billiard tables.

Nepveu, of Paris, for suspension rail-roads.

Hamelaërts, of Paris, for improved umbrellas and parasols.

Voury, of Paris, for wood pavements.

Bronzac, of Paris, for an improved mode for constructing buildings with artificial stones.

PATENTS FOR TEN YEARS.

To Miles Berry, civil engineer, of London, represented in Paris M. Perpigna, advocate, of the French and Foreign Office for Patents, Rue Choiseul, No. 2, ter., for improvements in the making of raised letters, figures, ornaments, &c.

Sénécal, represented in Paris byM.Perpigna, advocate, for means of transporting and unloading charcoal.

Levien, of London, represented in Paris by M. Perpigna, advocate, for colouring and preserving of wood.

Hasard, represented in Paris by M. Perpigna, advocate, for a bathing closet.

Holmes, represented in Paris by M. Perpigna, advocate, for castors for furniture.

Bergeret & Co., represented in Paris by M. Perpigna, advocate, for a boot-gaiter.

Paulican, of Juzier, (Seine and Oise) represented in Paris by M. Perpigna, advocate, for a new kind of shoe.

Ducruy and Sons, represented in Paris by M. Perpigna, advocate, for a machine for the cutting of gloves.

Bureau Briser and L. Bureau, of Rheims, for a califyer for the combing of wool.

Burghart, of London, for an apparatus for making and burning gas for illumination.

Obert, of Paris, for the polishing of combs.

Tyvrell, of Paris, for a machine for making rails.

Myers, of London, for improvements in wind instruments.

Renaudot, of Paris, for a seat for water-closets.

Gelis and Conté, of Paris, for a new medicament.

Mathieu, of Vaise, (Rhône) for a universal motive power.

Pearson, of St. Pierre le Calais, for improvements in lace.

Van Lockhorst, of Bruxelles, for a machine for making bricks.

Browne, of London, for a new method of fixing and engraving photogenic images.

Boneau, of Rouen, for a loom for making brace straps.

Barbereau, of Paris, for improvements in metal vases, for holding boiling water.

Aupretre, of Paris, for air muffs.

Truffaut, of Paris, for an improved motive power.

Huxley, of London, for an apparatus for regulating the temperature of stoves.

Pichenot and Co., of Paris, for manufacturing of fire-bricks.

Peyssel and Jourdan, of Marseilles, for improvements in the refining of sugar.

Lonchamp, of Bicètre, for improved bedding.

Boche, of Paris, for improved stoppers for shot bags.

Contzen, of Paris, for an apparatus for curing smoky chimneys.

Bonnet, of Paris, for ovens for bricks.

François, de Mazhières, for an hydraulic oscillator.

Tignères-Geraud, of Perpignan, for mechanism for preventing accidents in fire-arms.

Bisson and Mercier, of Valenciennes, for plummers' blocks, to be used in machinery and in rail-roads.

Gillour and Marchet, of Bordeaux, for a new kind of shoe.

Poole, of London, for printing of fabrics by means of blocks.

Morgan, of London, for printing of fabrics by means of engraved cylinders.

Turner, of Paris, for a steam-engine.

Benoit, of Troyes, for an improved press.

Taillebert, of Belleville, for an apparatus for decomposing coal to produce gas light.

De Blair and Chevalier, of la Teste de Buch, (Gironde,) for the filtration of resinous substances, and manufacturing of soap.

Hanriot, of Dijon, for improvements in clocks.

Séguin, of Paris, for a gas regulator.

Plessis, of Bonnétable, for moveable levers.

Boillé, of Paris, for improvements in looms.

Charpentier Sons, of Paris, for the manufacturing of weights in copper.

Prélat, of Paris, for improvements in fire-arms.

Pauwels, of Paris, for gas for illumination.

Madame Mayer, of Paris, for new gloves.

Maigret, of La Villette, for a brick-making machine.

Bapterosses and Feldtrappe, of Paris, for a wick-cutter.

Gallois, of Paris, for the manufacturing of canes, whips, &c., in whalebone.

Feuillâtre, of Paris, for a safety-cock, applicable to water-closets.

Réjany, of Paris, for improvements in typographic impressions.

Ratel, jun., of Paris, for a new lamp.

Moulin, of Grenoble, for improvements in cocks.

Allain, of Paris, for new hooks and eyes.

Yonge, of Paris, for the painting of walls.

Mellet Brothers, and Sehet, of Lodive, for an improved fulling machine.

Barrera, of Paris, for a composition of grease for lubricating machinery.

Mariage, of Lille, for improvements in the making of stearic candles,

Bellvalette, of Boulogne-sur-mer, for improvements in carriages.

[*To be continued.*]

New Patents

SEALED IN ENGLAND.

1841.

To James Tildesley, of Willenhall, Stafford, factor, and Joseph Sanders, of Wolverhampton, lock manufacturer, for improvements in locks.—Sealed 29th March—6 months for inrolment.

George Evans, of Dorset-place, Marylebone, for an improvement or improvements upon trusses, for the relief of hernia.—Sealed 29th March—6 months for inrolment.

Alexander Parkes, of Birmingham, artist, for certain improvements in the production of works of art, in metals, by electric deposition.—Sealed 29th March—6 months for inrolment.

John Lindsay, of Lewisham, Esq., for improvements in covers for water-closets, night-stools, and bed-pans.—Sealed 29th March—6 months for inrolment.

James Furnival, of Warrington, currier, for an expeditious mode of unhairing, mastering, and tanning various descriptions of hides and skins.—Sealed 29th March—4 months for inrolment.

Thomas Gore, of Manchester, machine maker, for certain improvements in machinery or apparatus, for roving, spinning, and doubling cotton, silk, wool, and other fibrous materials.—Sealed 30th March—6 months for inrolment.

John Oram, of Chard, in the county of Somerset, machinist, for improved machinery or apparatus for making or manufacturing netted fabrics.—Sealed 31st March—6 months for inrolment.

William Jenkinson, of Salford, machine maker, for certain improvements in machinery for preparing and spinning

flax, silk, and other fibrous substances.—Sealed 31st March —6 months for inrolment.

Joseph Gaury, of Watling-street, warehouseman, for a parachute, to preserve all sorts of carriages, using axletrees, from falling or injury, upon the breaking of their axletrees, —being a communication.—Sealed 31st March—6 months for inrolment.

John George Bodmer, of Manchester, engineer, for certain improvements in the construction of screwing stocks, taps, and dies, and certain other tools or apparatus, or machinery, for cutting and working in metals.—Sealed 3rd April—6 months for inrolment.

James Ogden, of Manchester, cotton spinner, and Joseph Grundy Woollam, of Manchester, aforesaid, commission agent, for certain improvements in looms for weaving.— —Sealed 3rd April—6 months for inrolment.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, civil engineer, for certain improvements in the process, mode, or method, of manufacturing lime, cement, artificial stone, and such other compositions,—more particularly applicable for working under water, and in constructing buildings, and other works, which are exposed to damp,—being a communication.—Sealed 3rd April—6 months for inrolment.

Zachariah Bryant, of the Town of Nottingham, machinist, for an improved method of manufacturing cloth and other fabrics, from woollen, cotton, flax, silk, and other substances.—Sealed 3rd April—6 months for inrolment.

James Anderson, of Newcastle-upon-Tyne, engineer, for improvements in windlasses.—Sealed 5th April—6 months for inrolment.

William James Barsham, of Bow, gent., for improvements in fastening buttons and other articles on to wearing

apparel, and other descriptions of goods or manufactures.—Sealed 5th April—6 months for inrolment.

Henry Mc Evoy, of Graham-street, Birmingham, hook and eye maker, for improvements in fastenings for bands, straps, and parts of wearing apparel.—Sealed 5th April—6 months for inrolment.

Jonathan Beilby, of York, brewer, for improvements in brewing.—Sealed 5th April—6 months for inrolment.

William Hutchinson, of Sutton-on-Trent, Nottingham, seed crusher and oil-cake manufacturer, for certain improvements in the manufacture of oil-cake, or seed-cake.—Sealed 5th April—6 months for inrolment.

William Littell Tizard, of Birmingham, brewer, for certain improvements in apparatus for brewing.—Sealed 5th April—6 months for inrolment.

Joseph Wilson Nuttall, of Belper, draper, and Henry Holden, of the same place, tailor, for improved apparatus to be attached to trowsers, commonly called trowsers straps.—Sealed 5th April—6 months for inrolment.

Joseph Apsey, of Cornwall-road, Lambeth, engineer, for improvements in the construction of flues for steam boilers and other furnaces.—Sealed 6th April—6 months for inrolment.

Christopher Edward Dampier, of Ware, gent., for improvements in weighing machines.—Sealed 15th April—6 months for inrolment.

Frank Hills and George Hills, of Deptford, manufacturing chemists, for certain improvements in the manufacture of sulphuric acid, and carbonate of soda.—Sealed 15th April —6 months for inrolment.

Henry Augustus Wells, of St. John's Wood, gent., for certain improvements in the manufacture of woollen cloths.—Sealed 17th April—6 months for inrolment.

Peter Kendall, of Gifford's Hall, Suffolk, Esq., for an

improved method or methods of connecting and disconnecting locomotive engines and railway carriages—Sealed 17th April—6 months for inrolment.

Joseph Barker, of Regent-street, Lambeth, artist, for improvements in measuring aeriform or fluid substances.—Sealed 20th April—6 months for inrolment.

Joseph Bentham, of Bradford, weaver, for improvements in weaving.—Sealed 22nd April—6 months for inrolment.

Henry Brown, of Codnor Park Iron Works, Derby, iron manufacturer, for improvements in the manufacture of steel.—Sealed 22nd April—6 months for inrolment.

Thomas Harris, of Hales Owen, near Birmingham, horn button manufacturer, for improvements in the manufacture of what are called horn buttons, and in the dies to be used in the making of such descriptions of buttons,—being partly a communication.—Sealed 22nd April—6 months for inrolment.

Humphrey Jefferies, of Birmingham, button-maker, for improvements in the manufacture of buttons.—Sealed 22nd April—6 months for inrolment.

John Rostron, of Edenfield, Lancaster, manufacturer, and Thomas Welch, of Manchester, manufacturer, for certain improvements in looms for weaving.—Sealed 22nd April—6 months for inrolment.

Floride Heindryckx, of Fenchurch-street, engineer, for certain improvements in the construction and arrangement of fire-places and furnaces, applicable to various useful purposes.—Sealed 24th April—6 months for inrolment.

Lancelot Powell, of Clydach Works, Brecon, iron master, and Robert Ellis, of Clydach, aforesaid, agent, for certain improvements in the manufacture of iron.—Sealed 24th April—6 months for inrolment.

Thomas Robinson, of Wilmington-square, gent., for improvements in drying wool, cotton, and other fibrous ma-

terials, in the manufactured and unmanufactured state.—Sealed 27th April—6 months for inrolment.

William Petrie, of Croydon, in the county of Surrey, gent., for a new mode of obtaining a motive power by voltaic electricity, applicable to engines and other cases where a motive power is required.—Sealed 27th April—6 months for inrolment.

Alexander Southwood Stocker, and Clement Heeley, both of Birmingham, manufacturers, for certain improvements in patten and clog ties, and other articles or fastenings of dress.—Sealed 27th April—6 months for inrolment.

Osborne Reynolds, the Rev., of Belfast, Ireland, clerk, for improvements in paving streets, roads, and ways.—Sealed 27th April—6 months for inrolment.

Benjamin Rankin, of College-street, Islington, gent., for a new form and combination of, and mode of manufacturing blocks for pavements.—Sealed 27th April—6 months for inrolment

André Drouot de Charlieu, of Coleman-street-buildings, gent., for improvements in preparing matters to be consumed in obtaining light; and in the construction of burners for burning the same, being a communication.—Sealed 27th April—6 months for inrolment.

CELESTIAL PHENOMENA FOR MAY, 1841.

D.	H.	M.	
1			Clock after the sun, 3m. 3s.
	—		☽ rises 2h. 53m. A.
	—		☽ passes mer. 9h. 2m. A.
	—		☽ sets 2h. 41m. M.
3			Occul 75 Virginus im. 13h. 12m.
3	11	55	♃'s first satt. will im.
3	12	17	♂ in conj. with the ☽ diff. of dec. 6. 16. N.
	21	56	☿ greatest hel. lat. S.
5			Clock after the sun, 3m. 30s.
	—		☽ rises 8h. 8m. A.
	—		☽ passes mer. Morn.
	—		☽ sets 3h. 42m. M.
	2	5	Ecliptic oppo. or ○ full moon
7	19	21	♃ in conj. with the ☽ diff. of dec. 4. 47. N
8	22	38	♄ in conj. with the ☽ diff. of dec. 4. 21. N.
9			Juno stationary.
	—		Occul σ Sagittarii im. 13h. 28m. em. 14h. 28m.
10			Clock after the sun, 3m. 50s.
	—		☽ rises 0h. 5m. M.
	—		☽ passes mer. 3h. 37m. M.
	—		☽ sets 7h. 15m. M.
	13	49	♃'s first satt. will im.
	15		☽ in Apogee.
13	0	0	Ceres greatest hel. Lat. S.
	4	21	☽ in □ or last quarter.
	—		Occul 37 Aquarii im. 15h. 10m. em. 16h. 22m.
14	13	12	♀ Inf. conj. with the ☉
15			Clock after the sun, 3m. 56s.
	—		☽ rises 1h. 43m. M.
	—		☽ passes mer. 7h. 20m. M.
	—		☽ sets 1h. 12m. A.
	19	53	Her: in conj. with the ☽ diff. of dec. 4. 34. S.
	—		Mercury R.A. 2h. 55m. dec. 15. 38. N.
	—		Venus R. A. 3h. 17m. dec. 20. 51. N.
	—		Mars R. A. 15h. 12m. dec. 7. 1. S.
	—		Vesta R. A. 0h. 35m. dec. 1. 56. S.
	—		Juno R. A. 11h. 36m. dec. 8. 4. N.
	—		Pallas R. A. 22h. 42m. dec. 8. 15. N.
	—		Ceres R. A. 0h. 38m. dec. 5. 36. S.
	—		Jupiter R. A. 17h. 5m. dec. 22. 10. S.
	—		Saturn R. A. 18h. 9m. dec. 22. 21. S.
	—		Georg. R. A. 23h. 37m. dec. 3. 13. S.
	—		Mercury passes mer. 23h. 18m.
	—		Venus passes mer. 23h. 31m.
	—		Mars passes mer. 9h. 29m.
	—		Jupiter passes mer. 13h. 22m.
	—		Saturn passes mer. 14h. 26m.
	—		Georg. passes mer. 19h. 54m.
19	4	18	☿ in conj. with ♀ diff. of dec. 2. 47. S.
	22	21	♀ in conj. with the ☽ diff. of dec. 3. 14. S.
20			Clock after the sun, 3m. 47s.
	—		☽ rises, 3h. 5m. M.
	—		☽ passes mer. 11h. 22m. M.
	—		☽ sets 7h. 57m. A.
	11	44	Ecliptic oppo. or ● new moon.
	1	5	☿ in conj. with the ☽ diff. of dec. 5. 37. S.
22	12		☽ in Perigee.
22	21	22	☿ in the ascending node.
23			Occul ω1 Geminorum, im. 8h. 56m. em. 9h. 40m.
25			Clock after the sun, 3m. 24s.
	—		☽ rises 8h. 30m. M.
	—		☽ passes mer. 4h. 33m. A.
	—		☽ sets Morn.
25	21	6	☿ in sup. conj. with the ☉
26	6	0	Vesta in conj. with Ceres, diff. of dec. 3. 57. N.
	26	6	♃'s first satt. will im.
27	3	10	☽ in □ or first quarter.
27	10	52	☿ in Perihelion
	12	48	♃'s second satt. will im.
	21	23	♀ in the descending node.
29	6	53	♂ in the descending node.
	8	58	♂ stationary
30	10	9	♂ in conj. with the ☽ diff. of dec. 5. 5. N.
31	10	33	♃'s third satt. will im.

J. LEWTHWAITE, Rotherhithe.

THE

London

JOURNAL AND REPERTORY

OF

Arts, Sciences, and Manufactures.

CONJOINED SERIES.

No. CXIV.

Recent Patents.

To William Morrett Williams, *of Bedford-place, Commercial-road, for an improved lock and key.*—[Sealed 27th February, 1840.]

This improved lock and key is constructed with peculiar and novel combinations of mechanism, intended to supersede the necessity of tumblers, as used in most of the patent locks at present known.

The peculiar mechanism is shewn, first, as applied to a padlock, see Plate XII., fig. 1, the back plate of the lock being removed for the purpose of exhibiting the parts within. The same is also shewn at fig. 2, the internal parts being in a different position, viz.—fig. 1. represents the bolt shot forward into the staple or bolt-hole of the jointed shackle, that is, locked; fig. 2, represents the same unlocked, or the bolt withdrawn from the shackle; fig. 3, is a section, taken transversely through the middle of the lock, in a vertical direction.

The case or frame of the lock is represented at *a, a*; the bolt at *b*, which is shewn detached at fig. 4. On the lower edge of the bolt, a rack, or series of teeth *c*, is formed. The end or tongue of the bolt is supported, and slides in the guide socket *d*, of the framing; and is guided in its sliding action by the screw *e*, passed through a slot in the tail part of the bolt.

Fig. 5, represents, in two positions, (one of them being in perspective,) the rack-box *f*, which is fastened to the lock plate immediately under the bolt, as shewn in figs. 1, 2, and 3. It will be perceived, that a longitudinal groove *x, x*, is cut in the upper part of this rack-box, in which the rack *c*, on the under side of the bolt, is intended to slide.

Fig. 6, is a side view of one of the several sliding pieces *g*, of which there are four employed in this lock, acting as guards, to prevent the bolt being slidden or moved from either its locked or unlocked position. These sliding pieces *g*, are to be inserted into the recesses or open parts of the rack-box *f*, one of which is shewn in the vertical section of the rack-box at fig. 7.

Fig. 8, represents the upper edges of these four sliding pieces *g, g, g, g*; in each of which there is a notch *x*, cut at a different distance from their several faces.

Fig. 9, is a side view of a forked spring *h*. The ends of the forks of this spring, when fixed to the lock plate, as at figs. 1, 2, and 3, fall into the perpendicular recesses or open parts in the rack-box *f*, and severally act against the faces of the sliding pieces *g*. These sliding pieces have each a tail or elongated part *i*, which is intended to be passed through the face plate of the lock, as shewn in the transverse section of the lock at fig. 3. On the face plate of the lock, a socket piece or key guide *k*, is affixed, with holes for the tails *i*, of the sliding pieces, to pass through, their extremities standing flush with the outside of the socket.

Fig. 10, represents the key or instrument by which these sliders may be moved, for the purpose of locking and unlocking; the face plate being removed in order to shew the parts within.

The bolt *b*, is projected forward into the locking position, as shewn in fig. 1, by a lever *l*, acted upon by a powerful main-spring *m*; and the bolt is slidden backward or unlocked, as shewn in fig. 2, by a feather spring *n*; a sliding piece *p*, having an inclined plane, (as seen in the detached figs. 11,) being at that time pressed against a tooth *q*, on the side of the lever *l*, (see also the detached figs. 12); which, by withdrawing the lever *l*, allows the feather spring *n*, to throw the bolt back.

Figs. 13, 14, and 15, are sections, taken through the padlock in horizontal directions, at the level of the top of the rack-box *f*, for the purpose of shewing different positions of the sliders *g*. Fig. 13, representing their quiescent state, when the bolt is projected outward, corresponding to fig. 1; and fig. 14, when the sliders are shifted by the key, in order to allow the bolt to be slidden back, as in fig. 2.

Now, supposing the bolt to be projected, that is, locked, as in fig. 1,—in order to unlock it, the key, shewn at fig. 10, must be applied to the front of the socket *k*. This key is formed by a rectangular box *s*, *s*, which contains two series of pins or punches, of various lengths, fixed in a central block *t*. The key-box is mounted upon an axis or pivots, which enable it to be turned over in its carriage or handle; so that either of the series of punches may be applied to the socket *k*, which is a substitute for the keyhole. One of the series of punches, as *v*, is for the purpose of unlocking; the other, *w*, for locking. By referring to fig. 13, (which represents the sliders in their quiescent state, after the bolt has been projected, as in fig. 1,)

it will be perceived, that the ends of the tails of the sliders are coincident or flush with the front of the socket *k*; but that the notches, in the several sliders, are then at variable distances from the front.

It will be understood, that the rack *c*, at the under side of the bolt, is continually in the groove *z*, of the rack-box *f*, (see fig. 1); and it will be perceived, that the several sliders *g*, in the recesses of the rack-box, at this time, stand in the notches between the teeth of the rack *c*, thereby confining and preventing the bolt from being moved along the groove *z*. In order, therefore, to unlock, that is, to throw back the bolt, all the sliders *g*, must be first pushed into such situations as will bring their notches *x*, into exact coincidence with the groove *z*, in the rack-box. This is to be done by applying the key to the face of the lock, at the socket *k*, and pressing it straight forward. The several plugs or punches of the key being fixed in the block *t*, at different lengths, suited to the distances to which the sliders are to be moved,—their pressure against the front ends or tails of the sliders will force all the sliders inwards, and cause their notches *x*, to be severally brought into coincidence with the groove *z*, as seen in fig. 14.

For the purpose of unlocking or throwing back the bolt, the part *v*, of the key, is to be employed, which has five pins or punches; the fifth pin or punch *y*, being designed to act against the tail of the sliding piece *p*. The key having being thus applied, and the sliders *g*, *g*, *g*, *g*, and *p*, all brought into the situations seen at fig. 14, the inclined plane of the slider *p*, by pressing against the bevel tooth *q*, on the lever *l*, will cause that lever to be forced back into the position shewn in fig. 2; when the notches *x*, in the sliders *g*, being all at the same time brought into coincidence with the groove *z*, the rack of the bolt will be set at liberty, and the bolt be immediately thrown back by

the power of the feather spring *n*, into the unlocked position, as fig. 2. On withdrawing the key, the forked spring *h*, acting against the faces of all the sliders, they will be passed through the notches of the rack *c*, under the bolt, into the situations shewn at fig. 13; by which the bolt will be held firmly in the unlocked position.

In order to project the bolt into the locked position, as represented at fig 1, the box of the key must be turned over, and the series of pins or punches *w*, be now applied to the socket *k*, as in fig. 16, to act against the tails *i*, of the sliders *g*; which, on being pressed home, will push back the sliders, so as to bring all their notches *x*, into coincidence with the groove *z*, of the rack frame, as shewn in the section at fig. 15; when the power of the main-spring *m*, acting against the lever *l*, will cause the rack of the bolt to slide freely along the groove, and hence the bolt to be projected into the locked position seen at fig. 1. The withdrawing of the key will again allow the forked spring *h*, to force all the sliders *g*, forward, through the rack of the bolt, into the situations shewn in fig. 13, when the bolt, as before, will remain securely held in the locked position.

The patentee states, that another form of rack may be made by inserting pins, in place of the teeth, in the under part of the bolt; or a series of perforations might be made in a rib, under the bolt, as shewn in the auxiliary, fig. 4*; in which case it would be necessary to make the sliders *g*, in the form shewn in the auxiliary, fig. 6*.

Fig. 17, is a lock for a door, in which the novel principle of construction is modified, to suit a rotary key; fig. 18, represents the lock in horizontal section. The reverse side of the bolt is represented detached at fig. 19.

Instead of the square rack-box, represented at *f*, and fig. 5, in the former construction, a cylindrical rack-box is

employed, shewn in several detached views and sections. Fig. 20, is an external view of the cylindrical rack-box, with the sliders within it; fig. 21, is a view as it would appear when protruded through the face of the lock, and which is the substitute for a key-hole, corresponding to the socket *k*, in the former construction; fig. 22, is the reverse or back end of the cylindrical rack-box,—the end plate, shewn at fig. 23, being removed; fig. 24, represents the cylindrical rack-box, in vertical section, for the purpose of exhibiting the internal forms of its passages and recesses, and the situations of the sliders and springs within; fig. 25, is one of the sliders *g*, detached, of which there are four employed as substitutes for the sliders shewn before at fig. 6; and fig. 26, is one of the spiral springs *h*, for pressing up the sliders, of which there are four, instead of the forked spring shewn at fig. 9, each acting in one of the recesses of the cylinder against the end of one of the sliders, as seen in fig. 24.

On the face of the bolt of this lock, (see figs. 17 and 18,) a plate *q*, is fixed; in which a T formed opening is cut, for the studs *r*, and *s*, in the plate attached to the end of the cylindrical rack-box, (see figs. 20 and 23,) to act in. By means of these studs working in the T formed opening, a rotary movement, given to the rack-box by the key, causes the bolt to be slidden to and fro. In the reverse side of the bolt, another opening is cut, having a double rack *c*, *c*, shewn in fig. 19; which rack answers to that marked *c*, under the bolt *b*, in figs. 1, 2, and 4, and acts in the circular groove *z*, *z*, round the middle of the cylindrical rack-box. This box is attached to the lock plate by means of two pieces of thin plate *t*, *t*, shewn in fig. 18; the circular edges of which take into a circular groove *v*, *v*, formed round the rack-box, as seen at fig. 20. When these thin plates *t*, *t*, are fastened to the lock plate, the

rack-box is securely attached to the lock, but is capable of being turned round freely.

The parts of the lock being put together, as shewn in figs. 17 and 18, and the rack *c, c*, of the bolt being in the groove *z, z*, of the rack-box, the bolt will be prevented from moving by the sliders *g, g*, in the rack-box laying in the notches between the teeth of the rack *c, c*, as seen in the section of the bolt with the rack *c, c*, and of the rack-box *f*, fig. 27.

It will now be perceived, that by pressing the end of the key against the outer end of the cylindrical rack-box, the pins or punches in the key will act against the tail of the sliders *g*, forcing them back against the springs until their notches *x, x*, are brought into coincidence with the groove *z*, in the cylindrical rack-box. The groove *z*, wlll then be completely open all round, and the racks *c, c*, of the bolt, will be enabled to pass through without obstruction.

Another modification of the improved lock, adapted to the cock or tap of a cask, is represented in the following figures:—Fig. 28, is a horizontal view of the cock, the plug being withdrawn, in order to shew the locking apparatus; and fig. 29, the under part of the cap-plate, at the top of the plug. This cap-plate *a*, is circular, covering a cylindrical box *b*, which contains the mechanism of the lock; and at the back is a socket *k*, to which the key is applied.

A rack-box *f*, shewn detached at fig. 30, is formed, with passages for the reception of a series of sliders *g*, one of which is represented detached, in two views, at fig. 31. These sliders are placed in the rack-box, their tails passing through the socket *k*; and behind each slider there is a spring, keeping them up to their proper bearings. In each slider there is a notch *x*, and in the rack-box a groove *z*, as before described; and the key, furnished with pins or

punches, being applied to the socket *k*, presses all the sliders into such situation as will bring all the notches *x*, into coincidence with the groove *s*, in the rack-box.

The under part of the cap-plate, fig. 29, has a circular rib or bead, part of which is cut into teeth, forming the racks *c*, *c*. This rib, when the cap-plate is put on, acts in the groove *s*, in the rack-box; and when the plug of the cock stands either in the open or closed position, the sliders *g*, in the rack-box, will lie between the teeth of the rack *c*, and thereby prevent the plug from being turned round; but, on applying the key to the socket, the plug may be turned round, and the way for the flow of the liquor opened.—[*Inrolled at the Petty Bag Office, August*, 1840.]

Specification drawn by Messrs. Newton and Berry.

To Henry Adcock, *of Liverpool, in the county of Lancaster, for improvements in raising water from mines, and other deep places; or from a lower level to a higher; which improvements are applicable to raising liquids generally, and to other purposes.*—[Sealed 23rd May, 1838.]

In describing this invention the patentee commences by saying, that in the present mode of raising water from mines and other deep places, by pumps and pump rods, and other mechanical contrivances, the water is raised through a series of pipes in a compact or solid state; in other words,—if the depth, through which the water is raised by one pump, or one lift, be 100 feet, then the pipes, extending that depth, will be full of water; and the whole column of water, in those pipes, will be lifted at one and the same time.

A column of water, 100 feet deep, presses with a force of

about 45 lbs. on each square inch of its base. Hence, if the diameter of the pump-bucket or plunger be 12 inches, and its area, as a consequence, 113 inches, the weight of water to be lifted by the pump, or other mechanical contrivance, at each stroke, will be about 5085 lbs. British avoirdupoise weight. In a deep mine, therefore, containing ten such columns or lifts of water below one another, and acted on at the same time by the same pump rod, extending down the shaft or pit of the mine, the weight of water to be raised is very great, being 50,850 lbs. Hence, to lift such weight of water, and to overcome the friction of the water in the pipes, together with the *vis inertiæ*, to put such columns of water in motion, and to support its own weight, the pump rod must be made of great strength; and the steam-engine, water-wheel, or other prime mover, by which the effect is produced, must be of large size, and great power.

By consequence of this *vis inertiæ*, the friction and the great weight to be put in motion,—and when steam-engines are employed, the alternate action or reciprocation of the great lever or beam of the engine,—the number of feet of effective strokes made per minute, is comparatively small, being generally, in deep mines, from about 50 to 80 feet. To explain this more fully,—the whole mass of water, in the ten columns, being raised at one and the same time, and, therefore, equal in weight to one column of water of the same diameter, and 1000 feet in depth, may be considered as being lifted in the mass, or through a distance of 50, or from that to 80 feet in a minute; whereas, by my "improvements in raising water from mines and other deep places, or from a lower level to a higher, which improvements are applicable to raising liquids generally, and to other purposes,"—I do not raise water or other liquids in the mass,

nor do I find it necessary to exert a pressure, at one and the same time, of 45 lbs. per square inch, as hereinbefore stated, when the height to which the water must be raised is 100 feet; nor do I raise water by pumps and pump rods, but in the manner now to be described; that is to say,—by the aid of a steam-engine, water-wheel, or other prime mover, I give motion to a fan or fanner, (such as is used very commonly by foundry men, engineers, millwrights, and others, to force a current of air into cupolas and other kinds of furnaces,) or to the piston of a blowing cylinder, (such as is used by iron masters and makers of iron, to force a current of air into blast furnaces for the reduction of ores); and by aid of such fan or fanner, or blowing cylinder, I condense atmospheric air that it may have a tendency to escape into the atmosphere, when liberated from its confinement, with a velocity due to its pressure.

When atmospheric air is condensed to a quarter of a pound pressure per square inch beyond the atmospheric pressure, and is liberated from its confinement, it moves, or has a tendency so to do, at the rate of 173 feet in each second of time; at half a pound pressure per square inch, the speed due to the pressure is 245 feet per second; at three-quarters of a pound, 296 feet; at one pound, 340 feet; at one pound and a quarter, 375 feet; at a pound and a half, 410 feet; at a pound and three-quarters, 436 feet; at two pounds, 467 feet; at three pounds, 555 feet; at four pounds, 624 feet; and at other pressures, with other velocities of rates of speed, as may be known by reference to, or consulting the, treatises that have been published on the science of pneumatics.

Now, instead of raising water in the mass, as hereinbefore described, by pumps or pump rods, and other mechanical contrivances, I avail myself of the mechanical effects to be obtained from the velocities of air, as due to

the pressures hereinbefore made known, or to any other pressures that circumstances, connected with mines in different localities, may prove to be desirable. I cause the water which must be raised from the mine, or from a lower level to a higher, to be dispersed and carried up in drops, like drops of rain; but the velocity of these drops upward, (in consequence of the velocity of the air, as due to its pressure as above described,) is far greater than the descending velocities of rain. For drops of rain, when not receiving an impulse from winds, can only descend through the atmosphere with a speed of about 8 feet in a second, when the diameter of each sphere or drop of rain is the hundredth part of an inch. When the diameter of the drop is the sixteenth part of an inch, the greatest descending velocity through the atmosphere is about 17 feet in a second; and the velocities, in a second, through the atmosphere, for drops of rain of other diameters, may be thus stated:—

For drops of rain an eighth of an inch diameter, 24 feet; for drops three-sixteenths of an inch diameter, 30 feet; and for drops a quarter of an inch diameter, 34 feet per second. Whereas the velocity of the air, when allowed to escape from a pipe upwards, at one pound pressure per square inch beyond the atmosphere, and without making any deductions for the friction against the sides of the pipe, is about 340 feet in a second. But it should be stated,— when the air is commingled with the water that must be carried up by it from a mine, or from a lower level to a higher, its motion to a certain extent is retarded.

The velocity of the drops of water, however, upward, by this mode, or by these modes of raising water from mines or other deep places, is far greater than the velocities at which rain usually descends, as hereinbefore described.

Figs. 1, 2, and 3, in Plate XIII., represent three differ-

ent kinds of apparatus, for carrying my aforesaid invention into effect; and in each figure the same letters of reference denote contrivances to accomplish similar objects.

The three kinds of apparatus are shewn in section. *a, a, a,* represent a pipe, made of zinc, iron, or other material, to convey air from the fan or fanner, or blowing cylinder aforesaid, down the shaft or pit of the mine, or to any other depth from which water or other liquid must be raised; *b, b, b,* another pipe, somewhat larger than the other, to convey the air aforesaid, and the water which is carried up by it, from the mine, or other depth, in drops to the surface of the earth, or to the adit, or to any required height or place of discharge; *c, c,* a chamber or reservoir from which the water or other liquid must be raised; *d,* metal, stone, or wood, to serve as supports.

By the rapid revolution of the fan or fanner, or the upward and downward motion of the piston in the blowing cylinder, by the steam-engine, water-wheel, or other prime mover, imparting motion to it as aforesaid,—atmospheric air, of the requisite amount of pressure, is made to flow down the pipe *a, a, a*; and where the pipe turns upwards in the chamber or reservoir *c, c,* aforesaid, it comes in contact with the water or other liquid, disperses it into drops, and forces it up the pipe *b, b, b,* and delivers it at the top.

In fig. 1, a series of apertures is represented near the bottom part of the pipe *b, b, b*; it is through these apertures that water or other liquid flows into the pipe, in a series of jets, and is dispersed and carried up the pipe by the ascending stream of air.

In figs. 2 and 3, the pipes *b, b, b,* terminate in chambers, compounded in shapes of a cone and cylinder, and the cylindrical part of each chamber, near the bottom,

is perforated with a series of apertures, through which the water or other liquid flows from the reservoir, or chamber *c, c*, into it. The water ascends above the termination of the air pipe *a, a*; it is there met by the ascending current or stream of air; it is dispersed into drops, and carried up by it, in the manner hereinbefore described.

In mines, and other deep places, where the water may accumulate, and rise to some height in the pit or shaft, from the stoppage, either from accident or otherwise, of the steam-engine, water-wheel, or other prime mover, or from other causes, I introduce a stop-cock, or other contrivance, adapted for the purpose, to regulate or exclude the admission of water into the pipe *b, b, b*, through the apertures herein described; such apertures being in connection with, and receiving their supply of water from, a pipe, to which such stop-cock is applied. I secure to this stop-cock or other contrivance, a rod, of wood or metal, sufficiently long to be above the surface of any water that may accumulate in the shaft or pit, and of sufficient strength to enable the workmen to open and shut the aperture of the stop-cock, or other contrivance, by it. It is essentially necessary that this should be attended to, or otherwise the water or other liquid may accumulate to such a height in the pipes *a, a, b, b*, as may prevent the passage of the condensed air from the pipe *a, a*, into the pipe *b, b*, and thereby stop the action of the apparatus; for a similar reason, the water or other liquid should never be allowed to stand at a higher level, above the bottom of the pipe *a, a, a*, than the pressure of the condensed air can displace. To effect this, the reservoir *c, c*, must be so proportioned, to the lower part of the pipe *b, b, b*, that whatever number of inches the water or other liquid may descend, by the pressure of air in the one, it will ascend to an equal number of inches in the

other, as in the two limbs of a syphon or bent guage; and further, to guard against the interruption of the process by the accumulation of water in the mine, and by an imperfect state of the stop-cock, allowing water to accumulate in the lower parts of the pipes *a, a, b, b,*—I connect, with the lower parts of such pipes, a small pump, to be worked by the hand of a workman, and rising to the required height in the mine, that any water, which may have so accumulated to the interruption of the process, may be withdrawn.

In other modes of applying my invention in practice, I cause the water or other liquid to flow into the apparatus, in any given time, in direct proportion to the quantity that can be carried up by it in that time; which may be effected by duly proportioning the size of the apertures or perforations, or by the adoption of regulating stop cocks; and, in other modes, I cause the air to be dispersed and distributed under a large surface of water, in a confined reservoir or chamber, that it may take up the water by adhesion, in the same manner that water is taken up in the formation of steam, excepting that, in the one case, the water is taken up by the air, in the other, by caloric. The water and air commixed, is then allowed to accumulate above the surface of the solid water, confined within the reservoir or chamber aforesaid, assimilating, in its object, to a boiler, for the generation of steam, until it attains the same pressure per square inch, as the air contained in the pipe *a, a.* It is then allowed to flow through a pipe, which extends above the surface of the water or other liquid, into the chamber, at the lower part of the pipe *b, b, b,* where it meets with, and disperses into drops, and carries up a further quantity of water, in the manner hereinbefore described.

The weight of water in the pipe *b, b,* at any one time, must be less then the pressure given out by the ascending current of air. At the top of the pipe *b, b,* I cause the air

and water to be received in a dome, or other appropriate chamber, that the greatest portion of water may be collected together again, in a body, and thence be allowed to flow freely away. The air, and such portion of the water still retained by it, is also allowed to escape.

The fan or fanner, or blowing cylinder, as the one or the other may be employed, may be made to receive air from the open atmosphere, or it may be made to receive it from the depths of the mine, by means of pipes, extending to the required distance. By this mode of operation, pure atmospheric air will descend the pit or shaft of the mine, by its gravity, to occupy the space from which the impure air has been withdrawn; and thus the ventilation of the mine, or other place, may be either wholly or partially effected.

In other modes of raising water by my improvements, as aforesaid, I produce and maintain, by any of the mechanical means adapted to the end, a partial vacuum in the pipe *b, b, b,* and instead of having a pipe *a, a, a,* extending to the surface of the earth, allow air to flow from the mine into it, through other pipes, arranged for that purpose, so that by the difference of pressure, between the air in the mine and that in the pipe *b, b,* the water may be carried up in drops, in the manner hereinbefore described.

Having thus described the nature of my invention, and the manner in which the same may be performed and carried into effect, I wish it to be understood, that the velocities of the air, as due to given pressures, and the descending velocities of drops of rain throughout the atmosphere, as herein described, in fact are given by me as approximate numbers only; for atmospheric changes and other causes will make a material variation from them.

And I wish it to be further understood, that I do not confine myself to the precise arrangement and disposition

of the combinations and contrivances herein described; but avail myself of such other combinations and contrivances, as in mechanics are equivalent thereto.—[*Inrolled in the Inrolment Office, November*, 1838.]

To DAVID HARCOURT, *of Birmingham, brass-founder, for certain improvements in castors for furniture, and other purposes.*—[Sealed 10th October, 1839.]

THIS invention may be divided into two parts;—the first of which is, in an improved construction of castors, either of the socket or plate description, whereby greater strength is obtained, and any unequal strain on the upright axis obviated. This is effected by applying a small antifriction roller to the horn of the castor, which will bear against the under part of the socket or plate, and thereby tend to support the axis in a perpendicular position.

The second part of the invention is, constructing the socket or plate castors with elongated pins, enclosed in tubes, which are inserted into the leg of the piece of furniture, and thereby made to retain the castor in its proper position, without the aid of screws.

The patentee has sub-divided his specification into four minor heads, consisting of different modes of constructing or manufacturing the last-mentioned castor; but, if the idea of elongating the pin or centre of the castor, and enclosing the same in a case or tube, is new, it is manifest that no person could make it in any manner, either of wrought, cast, or plate metal, without infringing the rights of the inventor. We, therefore, do not think it necessary to describe more than one, as there is no perceptible difference between them, except that of making the tube either of plate metal, or cast or malleable iron.

Plate XIII., fig. 1, represents the section of a socket castor, and fig. 2, of a plate castor, constructed according to the first part of the invention. *a,* is the socket in fig. 1, and the plate in fig. 2; and as the castors, with this exception, are identical, the same description will explain both figures, similar letters of reference being marked in corresponding parts.

The socket or the plate turns freely on a centre pin *b,* the lower end of which pin rests in a framing *c,* called the horn. This horn or framing hangs on a horizontal pin *d,* which passes through the upright centre pin *b.* An anti-friction roller *e,* is placed obliquely on a pin or stud, attached to the horn or framing, its periphery bearing against the under side of the socket or plate.

Fig. 3, represents a castor constructed according to the second part of the improvement. The centre pin or axis *b,* is much longer than those heretofore used, by which the bearing is carried up a considerable height, within the leg of the piece of furniture to which such castor is applied. This pin is enclosed within a tube *f,* and is enabled to turn freely therein, it being reduced so that it only touches the upper and lower parts of the outer tube. The conical upper end of the pin enters a conical hole in the piece of metal *g,* applied or affixed to the top of the tube.—[*Inrolled in the Inrolment Office, April,* 1840.]

To Henry Trewhitt, *of Newcastle-on-Tyne, in the county of Northumberland, Esq., for his invention of certain improvements in the fabrication of china and earthenware; and in the apparatus or machinery applicable thereto.*—[Sealed 4th December, 1839.]

This invention consists of a mode of fabricating china and earthenware by means of moulds or dies, and pressure.

In Plate XII., fig. 1, represents an elevation of a press, and dies or moulds; the details are shewn at fig. 2. 1, is the framing of the press; 2, metal plate; 3, represents other metal plates, which have grooves, from the centre outwards, in which the parts of the die or mould slide from and to the centre; 4, shews the three portions of the concave die or mould, which are opened outwards by means of the cords passing under the frame of the press, and they are moved by the roller,—they are pushed towards the centre by the springs pressing on the lever seen at fig. 1.—These moulds should be of copper.—5, is the pallet of the mould, part of which is raised, as the mould opens, to remove the vessel made, and facilitates its removal from the mould; 6, tube containing the springs; 7, the pulley and frame; 8, coupling swivels; 9, shews one half of the zinc cover of the table; 10, iron shaft or axis, acting as the conductor to the die or mould, which forms the hollow of the vessel; 11, the inner die or mould, turning on the end of the shaft 10; and there are two handles affixed to this mould or die, by turning which, when the act of moulding by pressure is complete, the die will be detached, and will, at the same time, polish the interior of the vessel; 12, is a section of the dies or moulds, and also the exterior frame which encloses the mould 4, and keeps them secure during the act of moulding; and there is a small rod, which, passing up through the lower part or bottom of the mould, raises the vessel when complete; 13, is a rod, around which the spring 14, used for forcing in the parts of the mould 4, is wound; 15, copper tube, in which the spring is contained; 16, is the bearing, in which the parts 13, 14, and 15, are carried; 17, shews the three parts, 13, 14, and 15, together; 18, the joining pieces 8, shewn separately, to be affixed to the rod 13, and to the cord; 19, guide pullies and their frames, separately shewn in the plan at 7; 20, is

an external frame or case, which is placed over the moulds 4, to hold them secure, when moulding by pressure; 21, plan of fig. 20; 22, shews the vessel separated from the moulds; 23, the inner face of part of the mould 4; 24, one-third of the plate 2.

It will be seen, that the arrangement of the moulds is such, that the various vessels made in the same dies or moulds will necessarily have the same uniformity and appearance; and by this mode, articles may be made at a much less expense than by the ordinary mode; and greater numbers may be produced, in the same time, without increasing the number of the workmen. Although copper dies or moulds are preferable, yet they may be made of other suitable material.

Fig. 3, is a press of somewhat different description to that before shewn; but it is not necessary to describe the mode of working this or the former press, as they are not new, with the exception of the dies applied thereto.

Although only two constructions of moulds or dies are shewn,—one for plates and the other for small jars,—it will be evident, that in making other vessels of china or earthenware, convex moulds or dies, of the figure of the interior, will be employed; and concave moulds or dies, having the figure of the exterior of the vessel to be made therein, will be necessary; and when the vessel to be made is deep, then the concave or die is to be of several pieces, capable of separating, to deliver the articles moulded.

The patentee claims the mode of making vessels in china and earthenware, by means of dies or moulds, and pressure; one of such dies or moulds being of the figure of the interior of the vessel, and the other of such moulds being of the figure of the exterior of the vessel, as above described. —[*Inrolled in the Inrolment Office, June,* 1840.]

To Luke Hebert, *of Birmingham, in the county of Warwick, civil engineer, for improvements in the manufacture of coffered spades and shovels, soughing and grafting tools, and other implements of a like nature.* —[Sealed 7th March, 1840.]

This invention is an improved method of placing the steel employed for forming the cutting edges and blades of coffered spades, shovels, soughing and grafting tools, and other coffered instruments.

In order to make the present invention more clearly understood, the patentee has described the ordinary method of constructing a coffered spade:—he says, the workman takes two pieces of iron, technically called "half moulds," and between them places a wedge-shaped piece of steel, and then welds the three pieces together; the combined mass is then "plated out" by hammering or rolling to the desired form, taking care to leave a cavity, called a coffer, for the reception of the lower end of the handle. This method of constructing a spade is shewn at fig. 1, in Plate XIII. *a, a,* represent the two half moulds, and *b,* is the wedge-shaped piece of steel, placed between them in order to be welded thereto.

The chief imperfection in this method, is the position of the steel; for as the spade, shovel, or other instrument, becomes worn by use, the edge (which ought to be in the form of a chisel and not an axe edge) is always produced from the upper iron plate instead of the steel; and this iron edge, after a little wear, becomes bent and torn, and therefore not only works unpleasantly, but speedily becomes foul, and thereby increases the labour of the workman.

The present invention is designed to remedy these evils, and is effected by placing the piece of steel on the top of

the two half moulds, which are previously joined together. The steel is united to the iron by welding,—the cavity called the coffer, being formed as in the ordinary manner.

This plan is shewn in fig. 2, *a*, *a*, being the iron half moulds, and *b*, the piece of steel. After plating out the spade by hammering or rolling, the steel will cover the entire upper surface of the spade, or the greater part thereof; and the wear will always produce and maintain a sharp chisel-shaped edge, which, from the hardness of the steel, will prevent the implement from becoming corroded or foul from the edge turning or bending up.

The patentee claims, firstly, the welding the two half moulds together previous to steeling them; and secondly, attaching or welding the steel on to the face of one of the half moulds, used in the manufacture of coffered spades, shovels, soughing and grafting tools, or other implements of a similar nature.—[*Inrolled in the Inrolment Office, September*, 1840.]

To Charles Dod, *of Buckingham-street, Adelphi, gent., for an invention of certain methods or processes for the manufacture of plate glass; and also of substances in imitation of marbles, stones, agates, and other minerals, of all forms and dimensions, applicable to objects both of use and ornament,—being a communication.*—[Sealed 12th November, 1840.]

This invention relates to certain new methods or processes for the manufacture of masses of colorless or colored glass, in one and the same time, giving them the forms which indicate their use, such as slabs, table-tops, chimney-pieces, vases, cups, columns,—in short, objects of all forms and

dimensions; and whereby those difficulties which have hitherto misled in casting or running glass direct from the melting pot into moulds, giving the required forms, and which has been attended with considerable expense, are avoided; since, by this process, the same results can be obtained, with variations of every kind. And also for the manufacture of colored glasses and other vitrified substances, with veins, rays, or stratifications; and in imitation, both as to their color, breaks, veins, rays, stratifications, and dispositions, of marbles and stones of all kinds, jasper, agates, porphyry, onyx, and lapis-lazuli, and rivalling them in brilliancy and beauty.

The following is a verbatim description of the invention, as set forth by the patentee:—

"I take glass of any sort, in pieces of any sizes, and either colorless or colored, and place it in moulds made of fire-clay or refractory earth, the interior surfaces of which I have done over, half with white plaister, or plaister of Paris, and half with talc, which gives me very smooth surfaces; and I also arrange the pieces of glass according to the disposition of the design I wish to form, if any. I place these moulds in a muffled furnace or oven, that is to say,—a furnace or oven, similar to those used by painters on glass, which are disposed in such a manner as to contain the pane of glass, hermetically surrounded or muffled, so that the muffle receives the heat, and transmits it to the glass, which is melted, after a certain time, by this process. My moulds being thus covered or muffled, that they may not be exposed directly to the flame, but to the heat only, and that only across the mould and the muffle, I gradually bring the heat of the furnace or oven to the temperature requisite for a commencement of fusion, which I increase to a degree sufficient to solder together all the parts or

pieces of glass enclosed in the mould, so that they become but one same and single piece.

If I desire to make vases or columns for instance, my moulds are analogous to those used in metal foundries, excepting only that my moulds are constructed of fire-clay, as before stated. I place above or over the moulds funnels or tunnels, made also of fire-clay, into which I pour glass, in a somewhat more fusible state; and which, in melting, fills into the cavities which remain between the pieces of glass contained in the mould. In short, it is easy to perceive, that by this operation I can make, in vitrified matters, objects of all forms, size, and thicknesses.

With furnaces or ovens, supporting a greater or less degree of heat, (and which depends upon their construction and materials,) I am enabled to unite thus into masses, of all dimensions, glasses of every description; and even minerals, resulting from a natural fusion, such as basalt, &c.

To succeed properly, it is essential that the heat, received by the mould, should be greater beneath than above; because, if the air contained between the pieces united by the fusion was enveloped by it, it would leave cavities, or produce an ebullition. My furnaces or ovens, therefore, are constructed upon the same principle as those used by bakers, with the sole difference, that mine are not heated by putting the fire within, but beneath; and it is also necessary, for the above reason, to produce that fusion slowly, and by successive gradations. I also permit my furnaces or ovens to grow gradually cool, after having hermetically closed them; and I open them only after a lapse of some time, calculated according to the sizes of the pieces contained, and which is sufficiently indicated by practice; the object being to prevent any risk of breakage being incurred.

To employ these methods or processes for the formation of blocks, and objects of all dimensions, in glass or other

vitrifiable substances, either in imitation of marbles and precious stones, or giving them fine imaginary effects, I have sought what would be the means of obtaining, at a low price, opaque and veined glasses of all colors, which I could put into form at will; and my researches led me to apply to vitrification the principle of the oxidation of metals, reduced by fusion in ordinary glass furnaces, in the mass of glass, to which I have been brought by the observations which chemists make upon minerals, in melting them by means of the blow-pipe. I have seen that a globule of glass, containing a metal, was reduced to a state of transparency by the fire called the fire of reduction; and that, in applying to the same globule the fire called the fire of oxidation, the metal contained in the globule of glass, where it had become more or less vitrified, looks the color peculiar to its oxide. I have sought what were the metals best calculated for these effects, and I have only in this respect had to follow the indications pointed out by the chemists. I therefore apply a known principle to a new production; for after having made glass in an ordinary glass-house furnace, containing metallic oxides susceptible of oxidation, by placing that glass in my moulds, as I have hereinbefore explained, I make them undergo the oxidation appropriate to them, and they then present the colors I desire, and which are all more or less opaque at will.

To instance one of the effects obtained by the application of this principle, and to prove the power of colorization, obtained by my processes, I will observe, for example, that silver, (one of those metals, the effects of which are the most sensible or observable,) reduced to the state of sulphur, after having divided it by a dissolution and precipitation of any sort, calcined with an equal quantity, in weight, of pulverized sulphur, will give, introduced into a composition of flint glass, in the proportion of one part in

two, or even three thousand, on removal from the glass pot, a transparent glass, and tinged only with a clear yellow;—this same glass, submitted to my fire of oxidation, becomes opaque, and of a whitish yellow throughout all its mass, there remaining only a small portion of transparent glass, which, interposed between that which has received the colour, produces the most varied effects of stratification. All objects thus manufactured, should be polished as looking glasses are, and which gives them the most beautiful effect.

The application of my methods and processes, hereinbefore described, upon a large scale, will effect a great saving in the manufacture of glass; and will also introduce new substances in the manufacture of those objects of use and ornament, to which, at present, marbles, stones, agates, and other minerals, are almost exclusively devoted.

With reference to the furnaces or ovens which I employ, and which are constructed similarly to those used by painters on glass, hereinbefore described, all modifications are good, provided the glass receives the heat in the manner hereinbefore described.

The application of talc, to prevent the matter from adhering to the mould, is merely an application, upon a large scale, of the use made of it by manufacturers of cameos, artificial eyes, &c.

And whereas, as regards the said invention, I claim the methods and processes, as hereinbefore described, for the several purposes to which they are severally and respectively applicable, as hereinbefore mentioned."—[*Inrolled in the Rolls Chapel Office, March,* 1841.]

To Edward Moody, *of Maiden Bradley, Wilts, yeoman, for improvements in machinery for preparing turnips, carrots, parsnips, potatoes, and all other bulbous roots, as food for animals.*—[Sealed 7th November, 1839.]

This invention may be described in a very few words:—It consists merely of a strong metal or other frame-work, in the form of a hollow inverted cone; the inner side of which is furnished with cutting instruments, placed diagonally, and either plain or serrated. In the centre of this first frame-work, which is stationary, another hollow cone is placed, revolving in suitable bearing. The outer surface of this cone is furnished with projecting ribs or bars, and its circumference is perforated with several longitudinal apertures.

The inner cone is much smaller than the outer one; and, consequently, when placed in its bearings in the centre of the outer cone, there is a space between them. Into this space the roots to be cut are introduced; and, as the inner cone revolves, the projecting ribs, formed thereon, press the roots against the edges of the cutting instruments, fixed on the inner surface of the outer cone, and thereby reduce or grind them to a pulp, or cut them into small pieces; in which state they are more beneficial to cattle than in the ordinary shaped cuttings. Those parts which are ground off the roots, pass through the holes formed in the inner cone, and drop down through the bottom into a proper receptacle below.

The patentee claims "the mode of combining the inner and outer frames or cones, the one moving and forcing the roots against suitable cutting surfaces, and having slits or openings through which the portions ground or cut off may fall, as above described."—[*Inrolled in the Inrolment Office, May*, 1840.]

To ALEXANDER FRANCIS CAMPBELL, *of Great Plumstead, in the county of Norfolk, Esq., and* CHARLES WHITE, *of the city of Norwich, mechanic, for their improvements in ploughs, harrows, scarifiers, cut-waters, and horse-hoes.*—[Sealed 17th June, 1839.]

IT is impossible for us to give representations of all the modifications of ploughs proposed under this patent, as they fill nearly twenty sheets of drawings. We will, however, state the general features of the improvements proposed, and then recite the matters of novelty claimed.

A double shear plough is constructed; one of the running wheels of which revolves in the furrow, the other upon the land, the axle lying obliquely to the horizon, and by way of guide and regulator of the depth of cutting. A roller is placed behind the sole; which roller is formed as the frustrum of two dissimilar cones, conjoined at their bases; one of the conical surfaces running upon the bottom of the furrow, the other against the land side.

Other figures represent double breast ploughs, for turning the land on both sides; some with swivel double-edged shears, for scarifying and hoeing, or pealing of the turf; and others for cutting deep, or into the sub-soil, and for draining; and there are also ploughs, with five or more shears, placed side by side, in a diagonal direction, for cutting several furrows at once.

The modifications, in the construction of all these, are fully set out in the specification, in a very long and laboured description; but the novel features, proposed to be claimed, are summed up nearly in the following words:—

The peculiar method of constructing the fore carriage and beam of the plough, by which great nicety of adjustment, in the draft, is obtained; and the peculiar form of

wheel or double conical roller, upon an oblique axle, employed to carry the head part of the plough; the application of suitable driving means to the hind wheels of ploughs for working a drill; the mode of overlapping and joining the shares or blades, in order to affix them; the application of a vertical wheel to the head of a double-breasted plough, and to horse-hoes; the method described of constructing a sub-soil plough, or sub-turf plough, and a draining plough; and lastly, attaching a series of ploughs on wheels, so as to allow the ploughs to be raised or depressed by suitable mechanism.—[*Inrolled in the Inrolment Office, December*, 1839.]

To Alexander Francis Campbell, *of Great Plumstead, in the county of Norfolk, Esq., and* Charles White, *of the city of Norwich, mechanic, for their improvements in ploughs, and certain other agricultural implements.*—[Sealed 28th May, 1840.]

The subjects of this patent, are certain modifications of the plans proposed in the foregoing patent, of June, 1839, for the construction of ploughs and other such like agricultural implements. The improvements are shewn in eleven sheets of drawings; and the description of their details occupy many skins of parchment; we are therefore, as in the former case, precluded, by our limits, from giving more than a general idea of the subjects.

The figures in the first part of the specification represent a variety of views of ploughs, suited for what the patentees call sub-turf and sub-soil cutting, in which the features of novelty are the modes of regulating depths of cutting, to be performed by the plough. Several figures of wheel hoes are there described, in which the draft chain is at-

tached, nearly in the middle of the beam, for the purpose of affording a greater degree of purchase at the handles, and enabling the direction of the plough to be more readily guided by the ploughman.

Another description of plough, called a ridge plough, is shewn in several figures, with a novel method of regulating the depth of its cutter. A single-furrow plough, running upon three wheels, forms another feature of novelty, with a double conical roller, as in the former patent, which is made hollow, and of cast-iron.

A double plough, having a shear which cuts on both sides, constitutes another novelty; and a mode of reversing the shear, which may be turned round as a turn-wrist plough, for producing double or broad furrows.

Certain novel modes of constructing, and means of adjusting the depth of the cutter of a drainage plough, is another feature; and lastly, a mode of attaching four shears to a plough, for the purpose of cutting four furrows at once, called a quadruple plough.

The specification concludes with a series of claims, which point to the various particulars of construction and modes of adjustment shewn in the eleven sheets of drawings.—[*Inrolled in the Inrolment Office, November,* 1840.]

To ARTHUR WALL, *late of Bermondsey, in the county of Surrey, but now of* 71, *Wapping Wall, Shadwell, in the county of Middlesex, surgeon, for his invention of a new composition for the prevention of the corrosion in metals, and for other purposes.*—[Sealed 2nd May, 1840.]

THE patentee describes his invention in the following words:—I place twenty pounds of the strongest muriatic

acid, diluted with about three gallons of water, in a shallow pan or vessel, made of cast-iron; I then take 112 pounds of filings, of either steel or bar-iron, or other wrought-iron; I heat them to redness, and throw them into the mixture of acid and water, for the purpose of oxydizing the filings. I then place the pan on a sand bath, (heated by a flue from a furnace,) which digests the filings, and facilitates the oxidation. I repeatedly stir up the whole; and after subjecting them to this process for about twenty-four hours, or until ebullition takes place, and the greater part of the filings is taken up by the liquor or mixture,—I allow the oxides, thus obtained, to run off through a tap into a vessel beneath, leaving the metal, not operated upon, at the bottom.

When these oxides are quite settled, the clear mixture or liquor is run off from them into a third vessel; and then the filings must be subjected to the same process, in the original mixture, to complete the oxidation, that is, they must be again made red-hot, and the mixture which has run into the third vessel, thrown upon them; and this process must be repeated until all the filings have oxidized that can be made to do so. The oxides thus obtained, I now expose on an iron plate, made red-hot over a furnace, until all moisture has evaporated from them, and they assume a red appearance. I then mix with them 16 pounds of quicksilver, by sifting it through a very fine wire sieve on to the oxides; and afterwards I intimately mix it with them by rubbing the whole down in a mortar, or other suitable process; and when so mixed, I then add as much water as will cover the surface, and from 8 to 9 pounds of strong nitric or nitrous acid, and again place the whole on the furnace plate or sand bath, and repeatedly stir it until all the menstruum or liquor has nearly or completely evaporated. I then place the whole mass in a mortar or other

pounding machine, and bray or pound it until it is in a complete state of blackness. I then mix it with water, and stir or wash it until all the light particles are washed out. I then allow it to settle; and when the settlement has taken place, the water is poured off from the sediment at the bottom; this sediment I then place in a crucible or earthen retort, with a receiver attached, adapted for the reception of any chloride or mercury that may escape or come over, (the contents of this receiver I preserve, in order to re-add to the general mass afterwards when cool); then I make it red-hot, and when in this state, plunge it into fresh boiling water, and after stirring it for a few minutes, allow it to settle. I then pour the water off, and let it cool, adding the chloride, as before stated; and after the last mentioned process, introduce one fourth its own weight of common black lead or minium, commonly called lead, according to the color which the operator wishes the composition to assume.

Previously to applying this composition to metal, I add to it such a quantity of a mixture of boiled linseed oil and spirit of turpentine, (in the proportion of 1 oz. of spirit of turpentine to the oil used,) as will reduce it to a state sufficiently liquid to be spread with a brush; this preparation I then apply, as thinly as possible, by means of a brush, to sheets of copper or other metal, which sheets I afterwards subject to a heat, gradually raised to about 301° of Fahrenheit's thermometer, so as to make the metal imbibe the preparation. This heat must be applied to the sheets of prepared metal without smoke or flame, by placing the sheets on trucks, in contact with the flue-plates, in the manner hereafter described.

The patentee then proceeds to shew the mode of applying heat to the sheets of copper or other metal, and for that purpose has given drawings of the furnace employed,

but there is no mention made of it in the specification.— We have therefore, by reference to the drawings, attempted a clearer description of the furnace than is given by the inventor.

Plate XIII., fig. 1, is a sectional plan view, shewing two horizontal flues *a, a,* which gradually incline from the fire bars to the extreme end, (see the longitudinal section, fig. 2,) for the purpose of producing a good draught, and communicating a stronger heat to the plates *b, b,* above, made of cast-iron, which form a covering to the flue.

The walls of the furnace may be built from three to six feet above the plates, to form the chamber *c, c,* the roof of which is made of sheets of iron, slightly curved, and covered in the usual way, to retain the heat.

To prevent the cracking of the walls, from the excessive heat required, it is necessary to bind them with iron bars *d,* see figs. 3, and 4, the former of which is an end view, and the latter a horizontal section of the furnace.

Each end of the chamber *c, c,* is closed by an iron plate, made to slide up and down by a pulley, so as to act as a damper, and let out or confine the heat. The heat from the flues is carried away by a common chimney, which has a damper in it for the purpose of controlling the heat.

The sheets of metal, prepared with the composition, as above described, are then placed upon iron trucks, between upright pins, which run on wheels of four inches in diameter, and are thus placed over the iron plates, made hot by the flues. The heat must be gradually applied, to prevent the composition from blistering on the metal, by the trucks being first placed at the extreme end from the furnace bars, and gradually rolled over the flue-plates till evaporation ceases, and the metal assumes a dark appearance;—this completes the operation.

When preparing iron tanks with the composition, the

furnace-heat applied, is merely sufficient at first to expel the moisture from the metal; and when in that state, they are taken out and sprinkled over with as much charcoal, very finely pounded, as will be absorbed by the metal; which gives to it, when prepared, a glossy appearance.—A stronger heat is then applied, and the operation is completed.

The patentee states, "I do not claim, as any part of my said invention, any of the separate processes, or the use of any vessels or furnaces, but I claim, as my invention, the composition, prepared as above described, for the prevention of corrosion in metals, and for other purposes."—[*Inrolled in the Rolls Chapel Office, October,* 1840.]

To Thomas Earl of Dundonald, *of the Regent's Park, in the county of Middlesex, for his invention of improvements in machinery and apparatus applicable to purposes of locomotion.*—[Sealed 5th November, 1835.]

The specification of this invention is a very extensive affair, and is divided into a great number of sections, from which we have made very copious literal extracts, in order that the patentee's views may be clearly seen.

He says:—Part of my improvements relate to machinery and apparatus which is applicable to the purpose of obtaining locomotion on land, and in carriages which are impelled on iron railways, by steam power; and other parts of my improvements relate to machinery and apparatus, which is applicable to the purpose of locomotion on water, in boats or vessels which are impelled on canals, rivers, or the sea, by steam or other adequate power.

First,—one of my improvements in machinery and apparatus, applicable to locomotive steam-engines, which are

to travel on iron railways, is to arrange, combine, and dispose the machinery and apparatus of such engines, in such manner as that the most weighty parts of the machinery and apparatus shall be much nearer to the ground than is usual in locomotive engines heretofore constructed, in order that the weight, which is disposed so low, may operate in the manner of ballast, to prevent the rocking motion, and to restrain the wheels of such engine from running off the rails by accident; and also, in case of running off the rails, in consequence of accidental breaking of a rail, or a wheel, or an axle, when travelling at a great speed, that the under part of the boiler, and weighty and lowest part of the machinery or apparatus, which must come in contact with the ground, shall be adapted to slide along the ground, in the manner of a sledge, whereby the engine will be preserved from overturning, and the friction of the sliding on the gound will bring it quickly to rest, together with all the train of carriages which are drawn after the engine, without any shock or violence which can do injury to the machinery or apparatus of thc engine, or to the passengers, or to goods in the carriages. And with a view to diminish the weight of locomotive steam-engines, and at the same time to cause their wheels, which are impelled by the steam power, to adhere firmly to the rails, so that the engine will be capable of drawing heavy loads after it without failure, by its wheels slipping upon the rails,—I construct the locomotive engine with the weight bearing chiefly on two wheels, fixed upon the two ends of one main axis, in place of distributing the weight on four wheels, upon two axes, as commonly practised; and the weight of the machinery and apparatus is equipoised upon the said main axis of the two wheels, so that it will sustain the whole or nearly the whole of such weight. And the hinder end of the frame of the engine so constructed, being connected, by the usual upright joint-

pin, with the tender-carriage which accompanies the engine for the purpose of carrying a stock of water and fuel, the engine with two wheels will be able, by means of motion about that joint-pin, to turn more easily when required to pass into crossings, or sidings, or turns off the rails, by which one line of rails is connected with another line of rails, or with a branch rail.

The fire-box and boilers, with their cross flues and water case, and all their apparatus, are suspended by straps, and supported by springs, whilst the engine partakes of the non-elastic motion of the axis, which (when the wheels meet with obstacles) is different from that of the boiler and apparatus, mounted on springs; and, for this purpose, the upright branch of the steam pipe is fitted into a stuffing-box, or is fitted with universal joints, to permit the differential movements of the engine and boiler. And the eduction pipes, for the same reason, must be similarly constructed; or the steam pipe and eduction pipe may be made of flexible hoses, such as are now used to supply water from the tenders of locomotive engines; and, in order to admit of the use of the flexible pipes or hose, before mentioned, which are formed of canvass with India-rubber, as steam pipes for the conveyance of high-pressure steam from the boiler to the engine,—I enclose such pipes within other like pipes, of longer dimensions, leaving an interval between the two, in which I retain water; or else I use such interval as a passage for the conveyance of feed-water to the boiler; and that water, by surrounding the interior steam pipe, and also surrounding the junctions thereof with the metallic pipes of the apparatus, will tend to the preservation of the flexible material from the effect of the heat and pressure of the steam which is conveyed through it.

Another part of my improvements in machinery or apparatus, applicable to the purposes of locomotion by steam

power on railways, is to apply, for such purpose, a pair of rotary steam-engines of the kind described in the specification of a former patent, taken out by me in December, 1833; in which engines, the external cylinder is the revolving cylinder; the central axis, together with the internal excentric cylinder, being fixed and restrained from turning round; wherefore the pair of external cylinders, having a sufficient enlargement of their circumference, will form a pair of impelled wheels for a locomotive engine.

And another part of my said improvements in machinery and apparatus, applicable to the purpose of locomotion on railways by steam power, is to expedite and facilitate the kindling the fire and getting up the steam in locomotive engines, in order to begin travelling. For this object, I employ a stationary steam-boiler, or any other steam-boiler, in which steam, being previously raised and kept up, will be always ready as an auxiliary boiler, to assist in getting up the steam in the boiler of the locomotive engines, by conveying steam into the latter from the said auxiliary boiler, through a suitable temporary communication, by a flexible steam pipe; and the steam, so introduced, will commence the heating of the water contained in the boiler of the locomotive engine, and the metal in the apparatus thereof, before the newly-lighted fire has had time to operate in the furnace of such boiler; or, for still greater expedition, the boiler may have hot steam blown into it from such auxiliary boiler, in order to give heat to all the metal parts of the apparatus; and, that being done, the locomotive boiler may be filled at once with boiling water, by transfer of a suitable quantity thereof from the auxiliary boiler; and, this being done, by the time that the fire in the locomotive boiler is ignited, a blast of steam, from the auxiliary boiler, may then be blown up the chimney of the locomotive boiler, through a suitable temporary communi-

cation, by a flexible pipe to the jet, in the chimney, in order to urge the fire and get up the steam quickly, whereby considerable delay will be avoided in starting the engine for service.

And after the production of steam is commenced in the locomotive boiler, but before it is sufficiently accumulated in the boiler to begin working, I propose to apply the steam, arising from the boiler, to blow through a small pipe and cock, and up the chimney, to urge the fire. And I propose, by opening the said cock more or less, to use a portion of the high-pressure steam from the boiler, in order to blow up the chimney at any time when the same may be required; but so as not to depend at all times upon the waste steam for urging the fire, but rather to give a more ample passage for the waste steam to escape, and to avoid any retardation or impediment to the free action of the engine; and if, by so doing, the action of the jet up the chimney does not produce so strong a draft as is desirable, then the deficiency may be made up by opening the cock, so as to admit as much high-pressure steam, up the jet pipe, as is requisite.

Another part of my said improvements, is to apply to locomotive carriages, for quick travelling on railways, piles or heaps of India-rubber and of cork, or other suitable substance, in cakes, laid one upon another, jointly with, or in lieu of metallic springs, for sustaining the weight with which such carriages are loaded; such piles of elastic substances to be enclosed, as it were, within inverted boxes, resting on the contents; and the weight, which is to be borne upon the lids or covers of such boxes, will have an elastic or springy bearing; such boxes may be applied over the axles of the wheels of the carriages. The said piles of cakes of elastic substances can be easily removed from the said boxes in which they are enclosed, when they be-

come warm, or too much consolidated, and new cakes put into their places. And I propose to apply like piles of elastic substances beneath the seats or benches, for the passengers in coaches which are to travel on railways, in order that, by resting thereon, the vibration and tremor of passing over the joints of the rails, may be diminished.

And another feature of my invention consists in applying guides to the wheels of carriages which are to run on such railways, enclosing one or each of the rails between them, which will form a very great security against running off the rails; and in case of running off, from failure of a rail, or other inevitable accident, then the same guides will form a support or sledge to slide along the ground, and preserve the carriage from overturning; and the same guides are adapted to operate as clogs or drags to the wheels of the carriages, in order to stop their motion upon the rails when required; and the said clogs or drags may be applied to the guides, in such manner, as to insert themselves beneath or between the wheels and the rails, or to lift the wheels from the rails, in order to take the bearing off the wheel; and in that case, the guides and clogs together form a support or sledge, to slide along the rails with a degree of friction proportionate to the weight of the carriage, which will very soon stop the motion of the carriage. The guides, by pressing or including the rails laterally, will preserve the said support or sledges from running off the rails.

The next part of the invention is for my improved tram-carriage, the frame of which, instead of being above and resting upon the axles of the wheels, as is now in use, is suspended below and from the axles thereof, whereby the centre of gravity of the carriage is lowered, and the rocking motion, so injurious to the wheels and to the rails, and so disagreeable to passengers, is diminished.

The frame of my improved carriage may be suspended

in various ways, either by springs, placed on or pendant under the axles; or it may be suspended from the axles by iron or other non-elastic straps, and the body of the carriage alone be mounted on springs; by which means, the frame will always maintain an equal distance from the rails, which is important to the uniform operation of my parallel guides and rollers, which I propose to attach to such carriage.

To the frames or other parts of my improved carriage, I add guide-plates, formed of iron or other metal, strongly bolted and attached to the framing; and such guide-plates descend therefrom, to suitable distances, below the level of the rails, in order laterally to embrace them, and prevent the deviation of the wheels from their proper course; and sometimes, for the like purpose, instead of guide-plates, I employ guide-rollers, which descend on one or both sides of the rails; which rollers do not bear on the rails nor on the ground, unless in the event of the breaking of the wheels or axles of such carriages. These rollers are firmly attached to a strong transverse central bar, or otherwise are strongly secured and rendered capable of resisting the vibratory efforts of the propelling wheels; and in order more effectually to prevent the deviating of locomotive trains from the line of rails, I divest the bearing wheels of the flanges now in use for the purpose of retaining the said wheels on the rails; which flanges, when any obstacle presents itself to the progressive motion of large wheels, become levers to surmount the rails, and so produce the evil they intended to remedy.

And another part of my improvements, is to avoid the inconvenience of crossing places in the lines of rails for passing out of the line of one pair of rails into the line of another pair thereof, which is now commonly practised, by turning the direction of one line, to bend obliquely, until

it runs into another line; but my improvement is to transfer locomotive engines, with their tenders and trains of carriages, from one line of rails to another, by a lateral motion of a moveable bridge or platform, which is interposed in the lines of the two rails, with a capability of transverse motion across from one line of rails to the other line; so that the engine, with its tender and train of carriages, being brought along the line of rails, until they arrive upon the moveable platform, and being stopped there in the same manner as would be done in bringing them upon the platform or weighbridge for being weighed, then the said platform is moved laterally, by its machinery, to carry the engine and carriages transversely from one line of rails to another line; and the lateral motion of the platform being stopped, when the rails upon it come to an exact correspondence with the other line of the rails to which the engine and carriages are to be transferred, they may then proceed along the new line. And, in case the two lines of rails are not exactly parallel, but one branches off from the other at an angle, then the lateral motion of the platform must be more at one end than the other, in order that it may move with an angular motion instead of a transverse motion, parallel to itself; all which may be easily effected by suitable arrangement of the cross road or rails on which the platform is to run laterally.

Respecting those parts of my improvements, applicable to the purpose of locomotion on water, by canals and rivers, I propose to employ locomotive engines to travel along the towing-paths of canals in lieu of horses, and to draw or tow boats or barges along such canals. The said locomotive engines may be similar to those which have been made for travelling upon common turnpike roads, (excepting in proportions); because, as the speed of progression of boats on canals must be necessarily slower than that of stage

coaches on roads is required to be, their pistons must be made of a suitable larger area to adapt them for exerting the full power of the steam at such slower speed as boats can travel on canals.

The adhesion of the impelled wheels to the towing-path, will be like that of locomotive coaches on common roads, which is so much greater than on the smooth surfaces of iron rails for railways, that it is not requisite to have so much weight resting on the wheels as locomotive coaches have been obliged to have, on account of the weight of the boiler which they carried; but, according to this part of my improvements, the boiler is to be placed on board the boat, and the steam conveyed to the engine by a steam pipe, which is conducted along the connecting beam by which the locomotive engine draws the boat, instead of a towing rope; and also the eduction pipe may be conducted, if necessary, along the same beam, to convey the waste steam from the engine to the chimney, and puff the waste steam up the chimney, in a jet, to augment the draft, as usual in locomotive engines.

And another part of my invention, applicable to locomotion on water, whether in canals, rivers, or the sea, consists in substituting air forcing pumps, or pneumatic apparatus, to force down air under the bottom of the vessel in lieu of the paddle wheels, commonly used in steam vessels for advancing such vessels through the water. For this purpose, the bottom of the vessel should be an inclined plane, below water, deepest forwards, and shallower astern; and by power of suitable machinery on board such vessel, atmospheric air being forced downwards, or through the bottom of the vessel, so as to go beneath that bottom at the fore part thereof, where there is the greatest depth of the inclined plane below water, then the said air will tend to buoy up the vessel higher out of the water, by acting

to displace water from beneath the inclined bottom; but, owing to the inclination thereof, the weight of the vessel will rest, as it were, upon an inclined surface of water, with air interposed between the bottom and the water, and acting as it were in the manner of rollers, to facilitate the advancing motion of the bottom over the said surface; and the inclined position of the bottom will give a constant tendency to the vessel to slide down forwards thereon, and overcome the resistance which the bow of the vessel must encounter in progressing through the water; and this action will continue as long as air continues to be forced down through the bottom at the stem; and the air passing along beneath all the length of the inclined bottom, makes its escape by rising up behind the stern.

The machinery for so forcing down air, may be of the same kind as is commonly employed for blowing into furnaces for melting iron, viz.—with cylindrical air-forcing pumps, the pistons wherof may be moved by the power of steam-engines, such as are used on board steam vessels, but which are adapted to apply their force and power to actuate the pistons of such blowing cylinders, or air-forcing pumps, instead of actuating revolving paddle wheels, as usual in steam boats.

And lastly,—I claim the application of the quicksilver apparatus, described in my former specification before referred to, in lieu of steam power, to force down air through the bottom of the vessel, at the fore part thereof, in manner herein described; or otherwise for the purpose of producing locomotion in such vessels. The power or forcible motion of that quicksilver apparatus being derived from the rolling motion and agitation which a vessel commonly experiences in the ocean, without the expenditure of fuel, is fully described in my former specification, as a means of condensing and expelling air to impel rotary or other engines for propelling the vessel.

And I claim the application of my said former improvements of quicksilver apparatus, for compressing air by power derived from the rolling and agitation of a vessel, to actuate any kind of engines which are or may be impelled by compressed air, whether of the kind commonly called rotary, or whether operating by cylinders, with pistons moving therein with reciprocating action.

Having now described my said improvements, I, the said Thomas Earl of Dundonald, do hereby declare, that I claim the use and application of my former rotary engines to the production of locomotion in carriages, ships, vessels, and boats; also the application of water around India-rubber or other flexible hoses or pipes, which may be used for conducting steam,—that water being contained in the space or interval left between the interior of other larger hose or pipes, by which such flexible hose, for the conveyance of steam, and the junctions thereof with the metallic pipes, are included; also the lowering of the centre of gravity of boilers, machinery, and apparatus of locomotive engines, carriages, and tenders, below the axles of the wheels upon which such carriages travel; also the use and application of two-wheeled locomotive carriages, propelled by steam, the first or last carriage of each train having four or more wheels; also the use and application of India-rubber springs, for equalizing tremor; also the use and application of parallel guide-bars at the sides of the rails on which the locomotive carriages travel, in order to prevent them running off those rails, such guide-bars being fitted with retarding blocks, or used as suspenders of the heavy part of the apparatus, or serving as sledges, to slide along the ground, should the carriages deviate from the rails; also the use and application of self-operating drags, which, when permitted, will tend to lift the wheels of locomotive carriages from the road, and transfer weight from the

wheels to non-revolving friction drags, bearing on the road or on the rails; also the use and application of guide-plates and guide-rollers to railway carriages, jointly with, or as a substitute for, flanges on the bearing wheels; also the use and application of water circulating plates in all kinds of locomotive boilers, wherein tubes, containing water, are exposed to the action of the fire,—such of those as are at one end of the tubes, being opened at the top, and the plates at the opposite end of the same tubes, being open at the bottom; also the use and application of moveable platforms for transferring locomotive trains or carriages, by lateral or transverse motion, from one line of rails to another; and also I claim the use and application of locomotive engines for dragging or tracking boats along canals, such locomotive engines travelling on shore, but being supplied with steam from boilers situated on board such boats; and further, I also claim the giving of locomotion to ships, vessels, and boats, by machinery or apparatus on board thereof, operating to force down atmospheric air below oblique planes, formed under the bottom or at the sides of the vessel, so that the air, in passing along such places, in order to rise to the surface, will exert a buoyant and impelling action to produce locomotion.—[*Inrolled in the Rolls Chapel Office, May,* 1836.]

To JOSEPH WHITWORTH, *of Manchester, in the county of Lancaster, engineer, for certain improvements in machinery or apparatus for cleaning and repairing roads or ways, and which machinery is also applicable to other purposes.*—[Sealed 15th April, 1840.]

THESE improvements in machinery or apparatus for cleaning and repairing roads or ways, consist in the application

of the rotary motion of locomotive wheels, to raise the loose soil, or other substance, from the surface, and deposit it in a vehicle attached. The apparatus employed has also a tendency, in its mode of acting, to repair the road by reducing the irregularities on its surface.

In Plate XIV., are various views of a machine, constructed on the principle above described. Fig. 1, is a side elevation; fig. 2, is a longitudinal vertical section; fig. 3, a plan of the machine. A, is a covered cart or carriage, suspended from the axle B, in the most favourable position for loading, by the bearings C, C, and springs D, D. The axle is of wrought-iron, and is made to revolve by being fastened to one of the locomotive wheels. The other wheel is put on loose, to preserve facility in changing the line of motion given to the carriage. The spur-wheel E, is keyed on the axle, and gears with the wheel F, on the crank-axle G, working in bearings H, H, attached to the cart. I, is a clutch, keyed on the crank-axle G. It may be slidden into gear with the wheel F, by the handle K. Motion is thus communicated to the crank L, from the axle of the carriage. M, is a lever, fixed to the axis N, working in bearings O, O, attached to the cart. The lever M, is connected by a loose joint P, to the arm Q, of the scraper R. The connecting rod S, communicates the motion of the crank to the lever M, and causes the scraper R, to rise up the inclined plane T, at the back of the cart, bringing with it any soil, &c., it may have taken from the road. If its own weight is not sufficient to keep it in contact with the incline T, it may be weighted for the purpose.

When at the top of the incline, the soil, &c., falls into the cart through the opening at U, and the scraper begins to descend with the return of the crank-arm. In the descent, it is guided by the rollers V, V, along the rods W, W; from the ends of which it falls upon the road, and is then

drawn forward, as before, up the incline T. In passing up the incline, the rollers V, V, raise the rods W, W, which work on studs X, X, on bearings attached to the cart. The rods W, W, afterwards fall back, by their own weight, into their proper places.

The incline T, at the end of the cart, is continued to the road by the iron plate Y, having a hinge Z, at the line of junction, to allow it to rise or fall, as the state of the road or the action of the cart may require.

The sides *a*, *a*, of the plate Y, project forward to form guides for the rollers V, V, of the scraper, after it has fallen from the rods W, W. These guides prevent the edge of the scraper from catching against that of the plate, as the former passes from the road to the incline. While the scraper is moving up the incline, and down the guide rods, the loose soil, &c., on the surface of the road, is collected behind the cart, ready to be taken up by the scraper at its next descent, as shewn by dotted lines, fig. 2. The apparatus for this purpose is shewn at figs. 1, 2, and 3. *b*, is a strong iron frame, carried on rollers *c*, *c*, and connected to the cart by arms *d*, *d*, fixed on the axis *e*, working in bearings *f*, *f*;—*g*, *g*, *g*, are scrapers, working in the frame *b*. To each scraper is attached a spring *h*, or weight, whereby it is made to bear against the road, and at the same time to accommodate itself to the irregularities of the surface by rising and falling, as the case may require. This action is facilitated by placing the scrapers at a considerable inclination to the surface of the road. They should also be slightly inclined to the line of draft, to prevent their coming in contact, at the same instant, with the edge of a row of "sets." Each scraper is made to lap over the one adjoining, so as to form a continuous surface.

The progress of the cart, drawn by a horse or other power, causes an accumulation of loose soil, &c., before the

scrapers *g*, *g*, which is taken up at intervals, in the manner before described. *j*, is a handle for raising the frame *b*, with the scrapers, from the ground, as occasion may require. If any difficulty should be found in emptying the cart from behind, the bottom may be made to slide, and the contents be deposited beneath.

Fig. 4, is a sectional side elevation of an apparatus, to be substituted for the frame *b*, and scrapers *g*, if it should be found better adapted to certain states of the road or way. *k*, is a circular brush or broom, the centre part of which is of wood or iron, and the beard formed of any suitable elastic material, such as birch or whalebone. The axis *l*, of the brush, has its bearings in the arms *d*, *d*, before described. Rotary motion is given to the brush from the axle of the cart, by the crossed chain *m*, passing over the pullies *n*, *o*.

The plate Y, forms an angle with the inclined plane T, and also a curve corresponding with that of the brush. It swings, as before, on the hinge Z, and rests on the surface of the road. The rotary action of the brush carries the soil from the road up the curve of the plate into the recess of the angle. A fixed bar *p*, commonly called a doctor, serves to clean the brush as it revolves, and causes any adhering particles of soil, &c., to fly off into the recess. The soil, thus accumulated in the recess, is drawn up the incline T, by the scraper R, in the manner before described. The apparatus shewn at fig. 5, is intended as a substitute for the scraper R, as well as the frame *b*.

The sides of the cart A, are produced to form the outline *q*, *r*, *s*, *t*, *u*;—*v*, is an endless brush or broom, or it may be described as a series of brushes, fixed in the chains *w*, *w*, stretched over the cylinders *x*, *y*. The axis *z*, of the cylinder *x*, has its bearings in the sides of the cart. The iron bars 1, 1, swing loose on the axis *z*, and form bearings

for the axis 2, of the cylinder *y*. They are introduced to balance the irregular action of the cart, and to keep the broom in contact with the ground.

The cylinder *x*, is driven from the axle of the cart by the crossed chain 3, passing over the pullies 4, 5, on the axles B, and X. The rotation of the pulley 5, gives motion to the endless broom U, causing it to sweep the surface of the ground, and carry the loose soil up the plate Y, and the inclined plane T*, into the cart at U. The inclined plane T*, swings on pivots 6, 6, and is held in contact with the endless brush by links 7, 7, connected to the iron bars 1, 1. Without this provision the broom would be liable to be drawn from the inclined plane by the irregular motion of the cart acting on the bars 1, 1. A doctor is stationed at 8, to clean the broom.

Fig. 6, is a sectional side elevation of an apparatus, similar to that shewn at fig. 5. At fig. 6, the endless broom is moved the contrary way by the open chain *q*. It acts in conjunction with a circular broom 10, revolving on its axis in bars 11, 11, loosely connected to the axis 2, of the cylinder *y*. Rotation is given to the circular broom 10, from the axis 2, by a crossed chain 12, passing over the pullies 13, 14. The loose soil is carried up between the two brooms. The portion adhering to the circular broom, is thrown off by a doctor at 15, and afterwards carried on by the endless broom to a second doctor at 16, where all that was taken up is deposited in the cart. Instead of chains, for connecting the series of brushes, an elastic cloth 17, is employed, and the soil thereby better held in passing upwards.

The apparatus described may be applied to other purposes besides those of cleaning streets; for example,—it might be employed to load a cart with sand or other loose substance, when the purpose is not to clean but to transport.

Though in the foregoing description and drawings various parts of machinery are shewn, already known and used, such parts are not claimed, except as regards the novelty of their combination or use.

The patentee claims, first, the parts described for raising the soil or other loose material from the surface of the ground, and depositing it in a vehicle attached; secondly,—(in connection with the parts included in the first claim,) he claims those parts for collecting the soil or other loose material before it is transferred to the cart; thirdly,—the use of a scraper or broom, or other instrument, moved up an inclined plane by the action of the locomotive wheels of a carriage to which that frame is attached, for the purpose of loading the said carriage with soil or other loose material from the surface of the ground; and lastly,—he claims the application of the rotary motion of locomotive wheels to raise soil or other loose material from the surface of the ground, and deposit it in a vehicle attached.—[*Inrolled at the Petty Bag Office, October*, 1840.]

Specification drawn by Messrs. Newton and Berry.

To John Jones, *of Westfield-place, Sheffield, for an improved table knife.*—[Sealed 7th November, 1839.]

This invention consists in lowering the cutting edge of the blade of a table or carving knife below the plane of the handle, so as to enable the person using the knife to bring the whole or a more extended part of the cutting edge into contact with the meat.

The figure, in Plate XIII., shews the manner in which a knife, made according to this invention, is constructed. It will be seen, that the upper edge of the blade is in a line with the lower edge of the handle; but the patentee

does not limit himself to that precise position, as the blade may be lowered still more, or not quite so much, as may be required; but he claims, as his invention, lowering the cutting edge of a knife below the handle, so as to render it more convenient to cut with.—[*Inrolled in the Inrolment Office, April,* 1840]

Scientific Notices.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from page 206, Vol. XVIII.)

Jan. 12, 1841.

JOSHUA FIELD, V. P., in the Chair.

"Remarks on the comparative advantages of long and short Connecting Rods, and long and short stroke Engines."

By John Seaward, M. Inst. C.E.

The author commences the communication with a description of the engines first placed on board the Steam Frigate, "The Gorgon."

The engines are constructed on the principle of "direct action," that is, the power is communicated directly from the piston to the crank, without the intervention of side levers, and the other parts usually employed in the construction of marine engines; this is one leading feature. Another is, that the main shafts are placed directly over the centre of the cylinder; and as these shafts are carried by strong frames and wrought-iron columns standing upon the cylinders, the force of the engines is confined between the cylinders and the frame, and thus isolated from the sides of the vessel. Other advantages accruing from this construction are, in the author's opinion, a saving of space and

weight, the absence of the vibration resulting from the action of the side levers, and a more efficient application of motive power, arising from the simplicity of the construction and diminution of friction.

Two main objections have been urged against this system—1st, that the shortness of the connecting rod causes a loss of effect; and 2nd, that the shortness of the stroke is a disadvantageous application of the power of steam.

The arguments in support of these objections are combated at considerable length. With reference to the alleged loss of power by the use of the short connecting rod, it is argued, that as no arrangement of long or short rods or levers could create power, so no arrangement of similar parts could be productive of loss of power. A geometrical investigation of the force actually exerted on the crank by long and short connecting rods, is then given, and the result deduced is, that by adding together the whole of the force exerted by the two kinds of connecting rods respectively, during one entire rotation, they both give the same actual amount; thus proving, that no loss arises from the use of the short connecting rod.

It is admitted, that there is some increase of friction on the journals of the connecting rod joints, but this occurs only at the extreme angles; some allowance is also to be made for the increased angular motion about the lower joints of the rod, but they are not collectively of sufficient importance to be considered as any objection in practice.

The calculations given are under the approval of Professor Airy, who thus expresses himself:—"The *greatest* force of the 'Gorgon' engines (when both cranks are below the horizontal line) is *greater* than the *greatest* force with common engines, but the *least* force is not less than the *least* force with common engines."

The whole power, in a complete revolution of the crank, is the same in both.

That a long stroke engine, under certain circumstances, may be more advantageously employed than a short one, is admitted:

but considering the steam engine *per se*, it is argued, that the latter possesses no advantage over the former.

In two engines of equal power, equally well constructed, the length of the stroke being respectively eight feet and four feet, the cylinder of the latter having double the area of that of the former, making the same number of revolutions per minute, and having the steam passages and valves of the same area, it is clear, that the mechanical action of the steam must be identical, because the same volume of steam will produce an equal mechanical effect, whether it be introduced into a long narrow cylinder, or into a short wide one; setting aside the effect of working expansively, which, however, is not at all affected by the shortening of the cylinder: for it is just as practicable to shut off the steam at one-half, one-third, or one-fourth of the stroke of a short cylinder, as of a long one.

The most essential differences between these two engines, must be in the relative amount of friction, and of radiation of heat from the cylinders and passages.

In a well-made engine four-fifths of the friction is due to the packings of the piston, air-pump bucket, and stuffing boxes, and about one-fifth to the gudgeons, crank-pin, and other moving parts. The friction of the piston packing is as the circumference multiplied into the space through which the piston travels, and into the depth of the packing; therefore in a cylinder of 30 inches diameter, 8 feet long, the friction of the packing will be as 24. while in a cylinder of 42·4 inches in diameter, 4 feet long, it will be only as 17.

The same train of reasoning is extended to the other moving parts, and shows that if the total friction in the short stroke be 100, that of the long stroke engine will be 123.

The radiation of heat from the cylinders will be as the relative areas of surface, which is less in the short stroke than in the long.

An examination of the comparative friction of the moving parts of steam engines is entered into; rules for computing, and tabular results are given; and the author concludes by observing,

that although the relative dimensions selected as examples, are uncommon in England, they are not so in America, where pistons of marine engines frequently travel at the rate of three hundred to four hundred feet per minute. It is contended that the speed of the piston is immaterial, provided the engine be well-proportioned to the speed; at the same time bearing in mind that a slow speed will be more favourable for the easy and pleasant working of the engine, and for durability. The paramount objects to be aimed at in the construction of marine engines are, the greatest saving of fuel, space, and weight, and the durability of the machine; and as the question is not whether the stroke should be eight feet or four feet, but relates to a diminution from the present length of seven feet to probably six feet, it is contended that the form of the "Gorgon" engines offers considerable advantages in the points treated of, independently of the positive diminution of weight and space, which forms no part of the immediate inquiry.

A drawing of the "Gorgon" engines accompanied the communication.

"Description of a Thirty-Ton Crane, erected on the Quay of Earl Grey's Dock, Dundee Harbour."

By James Leslie, M. Inst. C.E.

The Crane is placed on a stone platform sixteen feet square, raised six feet above the level of the Quay, with its centre seven feet back from the Dock face; and as the sweep or radius is thirty-five feet to the perpendicular of the jib-sheave, the load is suspended twenty-eight or twenty-nine feet over the Dock (as the double or single purchase sheave is used). The height of the sheave above the level of the Quay is forty feet.

Instead of the framing revolving about a fixed post, as in the usual mode of construction, the post itself is connected with the framing, and turns with it, so that the strain may be always in the direction of the greatest strength.

To avoid the extra dimensions of the castings for the post, if it had been composed entirely of cast iron, and for facility in the construction, the parts of cast and wrought iron are so combined that the "push" is thrown upon the cast-iron abutting piece, which is placed in front, while the back part, consisting of wrought-iron tension bars, bears the "pull." The two rings on the post are turned on the face and edges, and being bolted together form a fair surface for the friction rollers, while the back forms a rest for the tension bars.

These back tension bars are three inches wide by two and a half inches thick each, forming an aggregate section of forty-five inches. They were all proved in the bent form in which they are used, by making fast the ends of each bar to cross heads held apart by two logs, and suspending a load of twenty-four tons from the elbow formed by the bend in the bar; this was calculated to be equivalent to a longitudinal strain of ninety tons. There are also two side tension bars, two inches square each, firmly sunk in the cast-iron block, and bolted to the top of the framing.

The post revolves within a cast-iron cylinder, twenty-seven feet deep, five feet three inches diameter, with turned and bored water-tight joints. The whole is surrounded with masonry, bound together by strong iron hoops and diagonal tie bars passing through the fixed ring.

The jib is of oak, two feet diameter in the middle, and twenty-one inches at the ends; the two wrought-iron jib stays are each three and a half inches diameter; the chain is of $1\frac{1}{4}$ inch iron. Eight men easily lift a weight of thirty tons, and by means of the horizontal wheel-work one man can turn it round.

The total weight of the castings, wrought-iron bars, chain, and brasses, is about fifty-nine tons.

The crane was made and erected by Mr. Borrie, of Dundee, from the designs and under the direction of the author.

The communication is accompanied by two elaborate working drawings, on a large scale, with details of the mode of construction.

"A Refrigerator, or Machine for Cooling Brewers' Wort."

By Robert Davison, M. Inst. C. E.

The machine described in this paper was constructed for the purpose of ascertaining the most expeditious process for cooling wort, without deteriorating the quality of the liquor.

Two kinds of preliminary experiments were made, viz.—

1st. As to the rate of cooling by simple exposure to the atmosphere in the ordinary shallow vessel, having a superficial area of 420 square inches, the liquor being 1½ inch deep.

2d. As to the rate of cooling, under similar circumstances, with assistance of air mechanically driven over the surface of the liquor at different velocities.

In both cases the loss by evaporation was noted.

The numerous experiments are detailed in a tabular form, whence may be selected three series, which will give the average relative results.

Wort Cooled.	Naturally, under Atmospheric Temperature, 75°		1. By Blast at the rate of 32 miles per hour. Temp. 65°		2 Blast at the rate of 47 miles per hour. Temp. 65°		3. Blast at the rate of 57 miles per hour. Temp. 65°		4. Blast at the rate of 84½ miles per hour. Temp. 65°	
	min.	sec	min.	sec.	min.	sec.	min.	sec.	min.	sec.
From 160° to 150°	3	33	2	„	1	30	„	41	„	25
From 130° to 120°	8	30	1	10	2	4	1	6	1	7
From 100° to 90°	22	5	6	30	3	41	3	18	2	3

A higher velocity than 84½ miles per hour was found prejudicial, as a portion of the wort was driven over the side of the vessel.

The relative loss by evaporation was :—

By natural cooling	1·40
By blast, at 32 miles per hour . .	1·45
Ditto, at 57 miles	1·47

Hence it would appear, that the evaporation effected was about

the same in all the experiments; and the rate of refrigeration nearly in the direct ratio of the velocity of blast.

These results induced the author to try other applications of the blast, by causing the wort to flow down over a series of slightly inclined planes, being exposed at the same time to a powerful ascending current of air from a fan blower. The introduction of air directly into the wort was, however, found to raise a froth or "fob," which would affect the soundness of the beer. Several other methods were tried, and at length the machine, now described, was constructed.

The wort is pumped up at a slow and regulated speed into a recipient at the top of the machine,—divides into a series of thin films or streams, and trickles down the inside of a number of thin metallic tubes, set vertically, with their upper extremities quite level. Up these tubes is forced a current of air, at any required velocity, which, meeting the descending wort, cools it inside, whilst a constant change of cold water takes place around the exterior of the tubes. The wort, on leaving the vertical tubes, is received into a second refrigerator, containing a number of horizontal pipes, through which cold water flows. By this process the wort is cooled without producing any prejudicial effect upon its quality, and with a rapidity (as shown by the table) which would be extremely advantageous under certain circumstances.

This communication was accompanied by two drawings of the Refrigerator, and illustrated by a working model with which the experiments had been made.

"An Account of the Repairs and Alterations made in the Structure of the Menai Bridge, in consequence of the damage it received during the gale of January 7, 1839."

By T. J. Maude, Grad. Inst. C. E.

The roadway of the Menai Bridge having been seriously injured by the storm of January 7, 1839, it was deemed expedient

to renew entirely the suspended platform; and at the same time to carry into effect certain alterations in the construction, suggested by constant observation of the working of the bridge during thirteen years, as well as its condition after the storm.

In the original structure, each long roadway bar was fixed at three points to the vertical suspending rods. Motion being chiefly communicated to the roadway by the vibration of the windward chain, one end of the long bar suspended from it was lifted up, whilst the other two points of suspension remained nearly stationary. The bar thus became a lever, with its fulcrum at the middle point of attachment, and at that weakest part it invariably broke. In order to remedy this defect, an augmented depth of half an inch has been given to the new roadway bars, with an additional enlargement round the eyes for attachment to the suspension rods, and each bar is hung from two points only, permitting it to play when the bridge is subjected to motion.

The same vibratory action occasioned frequent fracture of the suspending rods close to the surface of the platform; to such an extent, that during the storm, a great portion of the platform was entirely torn from its fastenings on one side, and hung down flapping in the gale, supported merely by one line of rods. To remedy this, a joint has been introduced in each rod just above the surface of the platform, so as to allow the suspension rods free action, and permit a motion in either of the carriage-ways or the footpath independently of each other. The dimensions of the short suspensions rods have been increased to one inch and a quarter square, whilst the remainder of the rods are only one inch square. The effects of the lateral and undulating motions are provided against by the direction of the working of the joints, one of them being in the line of the roadway bar, and the other at right angles to it.

Additional rigidity has been given to the platform by applying a course of three-inch planking, laid transversely throughout its entire length, and bolted through each plank at intervals of two feet six inches apart, the oak beams originally placed beneath the platform, having been entirely removed.

For the purpose of checking longitudinal undulation, two lines of beams, formed of two pieces of Baltic fir, each 40 feet long, 13 inches deep, and 4½ inches thick, are framed to the trussed bearers, and bolted up beneath each carriage-way the entire length of the platform: at the same time an increased depth has been given to the wheel guides, which are also bolted through to the planking. The total depth given by these strengthening beams and guides, is three feet four inches, while in the original structure it was one foot four inches.

The weight of the additional timber and iron-work introduced into the bridge, is about 130 tons. The whole of the timber has been Kyanized, and each coat of planking covered with Archangel tar; the felt has been discarded, as it does not appear to have answered its intended objects in the original structure.

In these alterations (which were designed by Mr. Provis, M. Inst. C. E.) one main object, which was never lost sight of, was to preserve that simplicity of construction which is so striking a feature in the original design; and should any future derangements occur, any part can be repaired or replaced without disturbing the rest of the structure.

This communication was illustrated by a drawing of the original platform, and of the alterations described in the Paper.

February 2, 1841.

The President in the Chair.

"On a Method of setting out involute Teeth of Wheels, so that any two wheels of the same or of different diameters will work truly together, whether the teeth bottom or only just touch each other."

By Edward Cowper.

The rule is briefly this:—

Point off the teeth on the pitch circle in the usual manner; then take the smallest wheel of the set, and having decided upon the depth of the proposed tooth, describe a circle (called the Evolute) touching the bottom of the tooth. On all the other

wheels describe evolute circles, bearing the same proportion to *their* respective pitch circles, which the evolute circle of the smallest wheel bears to *its* pitch circle—thus, if in the smallest wheel the evolute circle is $\frac{1}{12}^{th}$ less than the pitch circle, let all the other evolutes be $\frac{1}{12}^{th}$ less than *their* pitch circles. From these evolute circles as bases, describe the involute curves of the teeth, making the curves pass through the points set out for the teeth, upon the pitch line.

"An Account of some Experiments to determine the force necessary to punch holes through plates of wrought iron and copper."

By Joseph Colthurst.

These experiments were performed with a cast-iron lever, 11 feet long, multiplying the strain ten times, with a screw adjustment at the head, and a counterpoise.

The sheets of iron and copper which were experimented upon were placed between two perforated steel plates, and the punch, the nipple of which was perfectly flat on the face, being inserted into a hole in the upper plate, was driven through by the pressure of the lever.

The average results of the several experiments (which are given in a detailed tabular form) show that

The power required to force a punch	Inch diam. 0·50	Through an iron plate	Inch thick. 0·08	is 6025 lbs.
Ditto	0·50	Ditto	0·17	is 11,950 lbs.
Ditto	0·50	Ditto	0·24	is 17,100 lbs.
Ditto	0·50	Through a copper plate	0·08	is 3983 lbs.
Ditto	0·50	Ditto	0·17	is 7883 lbs.

Hence it is evident, that the force necessary to punch holes of different diameters through metals of various thicknesses, is directly as the diameter of the holes and the thickness of the metals.

A simple rule for determining the force required for punching, may be thus deduced.

Taking one inch diameter, and one inch in thickness, as the units of calculation, it is shewn that 150,000 is the constant number for wrought-iron plates, and 96,000 for copper plates.

Multiply the constant number by the given diameter in inches, and by the thickness in inches; the product is the pressure in pounds, which will be required to punch a hole of a given diameter, through a plate of a given thickness.

It was observed that, duration of pressure lessened considerably the ultimate force necessary to punch through metal, and that the use of oil on the punch reduced the pressure about eight per cent.

A drawing of the experimental lever and apparatus accompanied the communication.

Mr. Sopwith called the attention of the meeting to the valuable Geological Sections presented by the railway cuttings, and other engineering works now in progress; this was particularly the case on the North Midland Railway, where the crops of the various seams of coal, with the interposing strata, were displayed in the clearest manner, developing the geological structure of the country which the railway traverses. Numerous similar instances induced the British Association to devote a sum of £200. (which it was believed would be increased from other sources), for obtaining authentic records of such sections, before the action of the atmosphere or the progress of vegetation should have obliterated the instructive pages of geology, which the engineer had opened to view.

The Committee of the British Association, especially charged with this subject, were desirous of bringing it before the Institution of Civil Engineers, for the double purpose of receiving from its Members those suggestions which they are so competent to give, and of obtaining from them that powerful aid and cooperation which the practical nature of their engagements so essentially enabled them to afford; it was accordingly suggested that the Council should receive from Graduates, descriptive papers and measured delineations of sections, as their communications previously to their Election. Much assistance might thus be

rendered, and the contributions, after having been read at the Institution, might be added to the general series preserved in the Museum of Economic Geology, which under its present able direction, is becoming daily more interesting both to the engineer and the geologist.

Mr. Sopwith exhibited a specimen of a blank chart, prepared by Mr. Phillips, of York, for the committee. It consisted of a sheet engraved in squares, on a scale of forty feet to an inch, containing a space equivalent to 800 feet in length, and 600 feet in height, upon which it was proposed to delineate their sections, in their true vertical and horizontal proportions; the base line representing either the level of the sea at half tide, or the datum line of railway, as might be most convenient. There would remain in every case a large portion of the sheet unoccupied by the section, and upon this it was proposed to exhibit, on a magnified scale, the details of the section; the fossils and other organic remains might also be shown, as the divisions of the squares would enable the sketches to be made of any dimensions in correct proportions. An example of these charts had been prepared by Mr. Phillips, giving a section of a deep cutting on a railway, the enlarged portion exhibiting the details of the strata at two particularly interesting points, as also of the specimens of sigillaria, stigmaria, &c., in that formation.

Mr. Sopwith, also laid before the meeting a set of models, which were intended as hand specimens for the purpose of familiarly explaining faults, slips, or dislocations of the strata, and other geological phenomena, which could not be clearly demonstrated without such assistance. One of these models represented the horizontal deposition of stratified rocks, and the subsequent removal or degradation of such rocks, forming valleys of denudation. Another, by the displacement of the lower rocks, exhibited the formation of a slip dyke, or fault, which was the "lode or vein" of the mineral miner, and the "fault" or "trouble" of the collier, as these interruptions of the continuity of the bed of coal were generally termed. Another model showed a succession of slip dykes disturbing the stratification, so as to present the

appearance of a great abundance of coal at the surface by the "cropping out" or "bassetting" of a number of seams or beds of coal, whereas in reality there was only a repetition of the same beds. By examining the base of the model, and also by opening it on an oblique plane nearly parallel with, and at a short distance below, the surface, it would be found that there was no coal at all. A fourth model exhibited the conditions under which some of the largest collieries in the kingdom are worked, namely, that the seams of coal do not appear on the surface, but on opening the model a vertical section is exhibited, and the several beds are shown, disturbed as in the former case by faults or dislocations, but which have not the effect of bringing the coal to the surface.

It has always been difficult to demonstrate, without the aid of models, the apparent form of strata, as effected by the contour of the country; sometimes the rocks form a V, pointing up the valley, and sometimes in the opposite direction. General observers, and even practical miners, were apt to conclude, that this different direction of the point of the V, indicated a different direction of the strata, but the models showed that in both cases the direction of the strata was the same; that in both cases the rocks were inclined in the same direction as the valley, the only difference being, that in one case the rocks form a greater, and in the other a less angle with the horizon than the bottom of the valley. The other models exhibted the "up-cast" and "down-cast" which occur in coal mining, and intersections of veins of different ages, &c. &c. Most of the specimens shown, presented details of the carboniferous formation, but models of this description were of course applicable to every formation and to every kind of geological structure. Mr. Sopwith brought forward this subject in hopes that eventually a close union and active co-operation might be established between the leading scientific institutions of this country, and more especially that the Geological Society and the Institution of Civil Engineers would unite in promoting the progress and improvement of geology and engineering.

Original Communication.

ON THE ENGINEERING OF THE ANCIENT EGYPTIANS.

BY J. S. PERRING, ESQ.

No. II.

Our last paper contained some remarks upon the hydraulic engineering of the Egyptians, and we propose continuing the same subject,—in describing the mode by which the Fyoom was supplied with water, and converted from an arid plain, surrounded by desert mountains, to the most fertile district of the richest country in the world.

Our old friend Herodotus does not seem to have described these works with his usual fidelity; but, by magnifying their extent and purpose, has given his narrative somewhat of the marvellous. We shall not, therefore, on this occasion, transcribe his account, but confine ourselves to a description of the works, as they appear to have been; derived from an examination of their remains, during the autumn of 1839.

The canals, which conveyed the waters from the Nile to the districts, and into the lake, are of great magnitude; but Herodotus, and other authors, have confounded them with the celebrated lake Mœris, which is only artificial, so far that the tract of low ground which it covers, was formed into a lake by being made the receptacle for the superfluous waters of the annual inundation of the Nile.

The canals were excavated for the double purpose of supplying the plains of the Fyoom with water, and as a means of drawing off a portion of the waters of the inundation, when its increase was too great, and the country endangered in consequence.

Though the Fyoom is connected, by a strip of land, with the valley of the Nile, yet it is impossible, from the height to which the rock rises in the gorge, that the waters of the river could naturally have connection therewith.

Without water the laughing plains of the Fyoom would be an arid desert; but its capabilities do not appear to have been long neglected; as far as the accounts which have reached us, we may

fairly conclude, that if not Menes, one of the earliest of the Egyptian monarchs, executed the splendid works of which we are speaking.

Works of sufficient magnitude to control the inundation of the Nile, could not be of an insignificant character; and, consequently, we find these have remained almost without repair unto the present period.

A dyke or bank was thrown across from the river to the western mountain, immediately below the entrance into the Fyoom. This dyke is nearly 15 miles in length, and is now called "Gisr e' Sultanee," the Sultan's or the Grand Dyke. Its slopes are protected by masonry or pitching for nearly its whole length, and it is capable, from its strength, of retaining the waters of the inundation.

There are many small sluices through it, at various places, but nearly at regular distances from each other; and when, through the great sluices of which we shall speak hereafter, the body of the waters coming down the Bahr Joussuffee, were thrown down the Fyoom, these sluices would be used for the passage of the water, necessary for the country below.

The Egyptians, in having many small sluices, shewed much judgment, as they were thus able to regulate the inundation with greater nicety; the heavy works, necessary in that country for building sluices of great magnitude, were thereby avoided, and the danger and inconvenience, resulting from accident to any one, much reduced.

From this dyke another extended from it, across the entrance of the Fyoom, and this too was pierced in places with small sluices.

Through an opening of the great dyke, passed the Bahr Joussuffee, which soon after divided into two arms, and at the end of the one, leading to the lower country, was a sluice, which, being closed, the water flowed along the other, parallel to the great dyke, and continued up to the western mountain, and formed a reservoir or lake, from whence the water was drawn into the Fyoom, passing through a sluice of three arches.

The present sluice is modern, built about seven years ago, in place of an ancient one, and on nearly the same plan. In addition to this sluice, the water finds its way through some smaller, in the dyke across the entrance of the Fyoom.

The water is received into a lovely basin, surrounded by the luxuriant and stately palm, and sweet scented acacia; and from this basin branches the great canal of the Fyoom, conveying the waters of the Nile to a district to which they have given fertility and beauty, and still continuing to fulfil the same beneficial purpose for which they were directed by the earliest of the mighty Pharoahs.

The main trunk of this canal is upwards of 15 miles in length, and from 80 to 120 feet broad; being partly cut through the solid rock, its terminus is at the capital of the district, where it becomes divided into a number of small branches, which are again subdivided into innumerable others; and the waters of each of which, after inundating or irrigating its particular district, find their way into the lake.

During the whole year the great canal, and the reservoirs near Illahoon, above spoken of, contain sufficient water for the supply of most of the smaller canals, wherewith to irrigate such lands as require it. The water, for this purpose, is raised to the surface of the land, by self-acting wheels, a mode peculiar to this province, and no doubt a fragment of knowledge derived from the ancient Egyptians, of whom there are more descendants here than in any other part of the country.* Throughout the East the usual mode of raising water is by the Persian water-wheel, set in motion by cattle; but here, float boards being attached to the wheels, the force of the stream acting upon them, turns the whole machine round. In the smaller canals, the water-way is narrowed, by side walls, and the velocity and force of the stream thus increased; but in the large canals, a space was enclosed within a pier and the shore, the walls splaying out to a funnel shape, to meet the current; and in some places many of these self-acting machines may be seen working together, raising the necessary water for irrigation, without any attendance whatever.

We have as yet described only one of the purposes of these works; but the other, of greater importance, was for conveying the superabundant waters of the inundation of the Nile into the lake Mœris; and, as the land of the valley of Egypt was then much lower than at present, it is probable that over inundation was more to be apprehended.

Over inundation would endanger the towns and villages, destroy the crops of Dhoma, and retard the seed time; and the grand intention of these works was to prevent these disasters, and to regulate the inundation throughout the whole country.

From near the middle of the great trunk canal of the Fyoom, at the village of Hawâra, (where are the ruins of the celebrated labyrinth,) branches another canal, of equal magnitude, of about 25 miles in length, which, skirting round the eastern side of the Fyoom, falls into the lake near Tomeëh, and thus avoids the cultivable land.

At its junction with the great canal of the Fyoom, is an ancient bridge of ten arches, the water-way of which, from pier to pier,

* The Fyoom escaped the first rage of the destructive conquest of the Arabs, by remaining unknown for more than twelve months after their entire possession of the whole of Egypt.

was dammed up by a low wall, which regulated the height of water in the canal, and afforded a great water-way when exceeding that height.

A little below the junction, at a place where the main canal is cut through rock, a pier is left in the original excavation, at about the middle of the stream; and it appears that this was left to form a sluice at this place, whereby the flow of water into the Fyoom could be wholly or partially shut off, and the water raised a sufficient height in the canal to be drawn off over the dam, and through the canal, leading directly to the lake.

The lake is now called "Beerkel el Karoon," and is about 30 miles in length, by an average breadth of 6 or 7. Though anciently somewhat larger than at present, it can never have been considerably so; and Herodotus has strangely overrated its dimensions, perhaps from having seen the Fyoom during inundation; and this surmise seems confirmed by his description of the pyramids in its centre, whereas the only remains, corresponding to his description, are at least 10 miles from the present borders of the lake.

We have endeavoured to give the grand features of this magnificent undertaking, whereby an arid basin was converted into a fertile country, said to have once contained 360 flourishing towns and villages; an inland sea, covering a surface of upwards of 200 square miles, created; and the safety and well being of all Egypt ensured.

The skill of the design, effecting these important objects, shews that the reputed knowledge of the Egyptians was not an idle story, and that their wisdom was not, as among the Greeks, confined to mere speculation, but directed to serve the best interests of man.

Raynal observes, that "a country where nothing is met with so seldom as a spring, and where rain is an extraordinary phenomenon, could only be fertilized by the Nile. Accordingly, from times of the most remote antiquity, fourscore considerable canals were digged in the kingdom, besides a great number of smaller ones, which distributed these waters all over Egypt."

Canals were no doubt first formed for the purposes of irrigation, and being afterwards found equally useful for internal communication, their use and purpose were extended. The Egyptians made two additional branches or mouths to the original five of their river; and so intersected does Herodotus describe the country, after the labours of Sesostris, that he says, "canals occur so often, and in so many winding directions, that a journey on horseback is disagreeable,—in carriages impossible."

The constant occurrence of boats in the scenes, represented on the sculptures of the tombs, shew that the traffic and conveyance was principally by water.

To the mighty Egyptian conqueror Sesostris, is ascribed, by Pliny, Strabo, and others, the commencement of a canal to unite the valley of the Nile with the Red Sea.

Herodotus and Diodorus ascribe the commencement of this canal to a later monarch, who may have restored or repaired it, for modern research has shewn that it existed during the reign of Sesostris.

The necessity for this canal, shews at that early period, the commerce which existed between India and Egypt; and the extent of this commerce is also shewn by the fleet of 400 vessels of war, which, Diodorus informs us, Sesostris fitted out on the Red Sea.

Herodotus thus describes it: "The length of the canal is equal to a four days' voyage, and it is wide enough to admit two triremes abreast. The water enters it from the Nile, a little above the city of Bubastis;—it terminates in the Red Sea, not far from Patumos, an Arabian town, They began to sink this canal in that part of Egypt which is nearest Arabia. Contiguous to it is a mountain, which stretches towards Memphis, and contains quarries of stone. Commencing at the foot of this, it extends from west to east, through a considerable tract of country, and where a mountain opens to the south, is discharged into the Arabian gulf. From the northern to the southern, or, as it is generally called, the Red Sea, the shortest passage is over Mount Casius, which divides Egypt from Syria; from whence to the Arabian gulf, are a thousand stadia. The way by the canal, on account of the different circumflexions, is considerably longer. In the prosecution of this work, under Necos, no less than one hundred and twenty thousand perished. He at length desisted from his undertaking, being admonished by an oracle, that all his labour would turn to the advantage of a barbarian," that is a stranger.

Diodorus Siculus gives a somewhat similar account, but speaks of it as then in use; and mentions that, after the attempt above related of Necos, Darius the Persian carried on the work something further. "Afterwards Ptolemy the Second finished the canal; and, in the most proper place, contrived a sluice for confining the water, which was opened when they wanted to sail through, and was immediately closed again, the use of it answering extremely well the design."

We have ourselves traced the canal for nearly its whole distance, from the Pelusiac branch of the Nile, near Balbeis, to the head of the Red Sea, a short distance north of the present town of Suez. Its total length was about 100 miles, and width from 80 to 100 feet. The arrangement of this canal, and the concurrent testimony of ancient authors respecting the height of the Red Sea and the land of Egypt, shews that the Egyptians were well acquainted with the science of levelling, and that too, for long distances, with the greatness correctness.

From the remains of monuments, found upon its banks, there can be no doubt of its having been carried into successful operation previous to Sesostris; and that to Necos, Darius, Ptolemy, and the Romans, belong only the minor honour of re-opening it. From being for great part of its distance in sand, it required constant attention to keep it open; and whenever anarchy and war diverted attention from the more peaceful pursuits of commerce, it became choked up; and we find that on the re-establishment of order, it required to be restored.

The history of this canal is curious, and shews its importance. Constructed by one of the early monarchs of Egypt—attempted to be restored by a later, who was deterred by being told that he was working for the stranger—its importance and utility has always been so apparent, that each conqueror of Egypt has successively attempted to restore it as soon as his authority was firmly established.

The early Arab account of the different attempts made by them to restore it, is highly interesting and instructive; but, from not entering in our present design, we cannot transcribe it at length. Their chief difficulties arose from being unacquainted with the use of locks or sluices; and, after several mishaps, they contented themselves with bringing the waters of the Mediterranean, on the one side, by a canal, as far as a place called El Hamah, and the waters of the Red Sea, by another canal, to near the same place; so that, as El Masoodi says, "the merchants from both sides met in the middle of the route, and sold and bought their goods; which, in this manner, were transported without loss of time from one sea to the other." But, having no current to keep it clear, it was soon filled up with sand. After this, it does not appear to have been re-opened, although the Caliph Raschid, and also Amron beni As, formed the project of restoring it; yet they were both deterred by the same fear that induced Necos to relinquish it, viz.,—that it would be for the benefit of the stranger; and it is singular the same argument was used to prevail upon the present Pacha from forming the Cairo and Suez railway, having the same object in view. It has also been proposed to him to restore the canal, and the author of these papers has been consulted upon the subject, on several different occasions.

The master mind of Napoleon saw its importance, and under his direction the line was surveyed, and estimates made for restoring it; and, to the credit of the ancient Egyptian engineers, it was found impossible to fix upon a better line, and little more was proposed to be done than to restore it according to the ancient design.

[*To be continued.*]

Scientific Adjudication.

JURY COURT,—*May* 14, 15,—1841.

Brown *v.* Annandale & Son.

We have received from our Law Agent, at Edinburgh, the following Report of a Patent Cause, tried in the Jury Court, at Edinburgh, which, by its decision, if ultimately confirmed, will establish a principle totally opposed to all previously conceived notions of the Scottish Law, in reference to inventions introduced into that country from England. We have not space at present to argue the question, but in our next, hope to be able to lay before our readers such facts and reasoning as will prove that this decision cannot be permanently established; for if it were, by far the greater number of the Patents taken in Scotland, would become null and void.

The pursuer is a paper-maker, at Esk Mills, near Penicuik. The defenders are paper manufacturers, at Polton, near Lasswade; and the action was one of interdict and of declarator, and for damages against the defenders for using and infringing a patent, which the pursuer obtained in February, 1836, for Scotland, for his invention of a certain improvement or improvements in the machinery or apparatus for making paper. The issues sent to the Jury were as follows :—

"It being admitted, that on the 4th day of February, 1836, the pursuer obtained letters patent under the Seal used in Scotland, in place of the Great Seal, whereby there was granted the exclusive privilege, during the period of fourteen years from the said 4th day of February, 1836, of using, as his original invention, certain machinery, as described in the said letters patent, and in the specification enrolled in the Court of Chancery, for the application, in paper making, of a vacuum to the horizontal web of wire-cloth of a Fourdrinier machine, in the manner described in the said specification.

"Whether, during all or any part of the years 1839 and 1840, at the paper-mill works of the defenders, at Polton, subsequent to the date of the said letters patent and the said specification, the defenders, by themselves or others, without the consent or permission of the pursuer, wrongfully, and in contravention of the said letters patent, used in their said works machinery in imitation of and substantially the same, with the machinery described in the said specification, to the loss, injury, and damage of the pursuer?

"Or, whether the said machinery described in the said specification is not the original invention of the pursuer? Whether a machine or machines, constructed according to the description in the said letters patent and specification, is not practically useful for the purposes therein set forth? Whether the description of the machine, contained in the said specification, is not such as to enable workmen, of ordinary skill, to make a machine capable of producing the effects set forth in the said patent?

"Damages laid at £1000."

These issues came to be tried before Lord Mackenzie.

Counsel for the pursuer—Dean of Faculty Hope & Patrick Robertson, Esq. Agents—Messrs. M. and J. Lothian.

Counsel for the Defenders—Duncan M'Neill, Esq., and Robert Whigham, Esq. Agents—Messrs. Scott, Rymer, and Scott.

Mr. Patrick Robertson stated the case of the pursuer to the Jury in a full and elaborate speech; and he pointed out, from models and plans, the novelty of the pursuer's invention, and the infringement of it alleged against the defenders.

The Dean of Faculty, on the same side, then called and examined Mr. Jardine, civil engineer, Dr. Andrew Fyfe, Mr. Baird, of Shotts Iron Company, Mr. Umpherston, millwright, Mr. W. Chambers, publisher, and Mr. R. Dawson, to prove the pursuer's case.

For the Defenders, Mr. Duncan M'Neill replied, and contended that the pursuer had failed entirely in establishing the affirmative of his own issue. And then he stated that the defenders would prove that what the pursuer alleged was his invention, was not his invention—that it had been used and practised extensively in England and Scotland, long before the date of the pursuer's patent; and farther, that the patent was bad, because of its vagueness and inconsistency.

At the close of Mr. M'Neill's address, the Dean of Faculty objected that any use of the patent invention in England could not be admitted to affect a patent for Scotland; and that any extent of prior use in England being to Scotland in this question, a foreign country, was irrelevant.

Mr. Whigham, for the defenders, answered, that prior use and practice of an invention in England was, since the union of the two kingdoms, as fatal an objection to a Scotch as it would be to an English patent; that we were now one kingdom or realm, owed one allegiance, and enjoyed equal rights, privileges, and protection in all respects; and that for any one to take a patent for Scotland for that which the lieges had for years freely used and enjoyed in England, was inconsistent with the articles and whole spirit of the Union, as well as of the statute passed in the reign of James with reference to patents. But he stated, that the point had been decided, Roebuck *v.* Stirling, in 1774. The Court of Session then found a Scotch patent invalid, in respect of prior use in England of the same invention. The judgment assigned that as the sole reason for invalidating the patent; and, on an appeal by the patentee, the judgment was affirmed by the House of Lords. After the Dean of Faculty and Mr. M'Neill had also addressed the Court on the point, it was arranged, as it was then past six o'clock, that the case should be adjourned till next day, and till then his Lordship delayed giving judgment on the point. On Saturday, his Lordship delivered a clear and decided opinion, that the case of Roebuck was exactly in point; and that the evidence of prior use in England must be admitted; that there was no conflicting authority either in England or Scotland; and farther, that, on sound principle, there being now only one kingdom or realm, the objection could not be listened to without leading to the most anomalous consequences. His Lordship, therefore, allowed the evidence, tendered by the defenders, to be received; whereupon the Dean of Faculty lodged in process a minute for the pursuer, stating that the pursuer admitted the fact of prior use in England, and that the defenders were entitled (subject to the question of law) to a verdict, finding that the invention was not the original invention of the pursuer, and that, if the evidence was found to have been properly admitted which the defenders had tendered, and which was admitted to be sufficient, they were entitled to *absolvitor* from all the conclusions of the conjoined actions of interdict and declarator. The Jury therefore found for the defenders, that the machinery described in the pursuer's specification, was not the original invention of the pursuer.

COURT OF EXCHEQUER CHAMBER.

Before Baron Parke & a Special Jury,
May 4th. 1841.

Neilson & Others *v.* Harford & Others.

This was an action for an infringement of a patent right, granted to the plaintiff in September,* 1828, "for the invention of an improved application of air to produce heat in flues, forges, and furnaces, when bellows, or other blowing apparatus, are required."

The counsel for the plaintiffs were Sir W. Follett and Mr. Fitzroy Kelly.—For the defendants—the Attorney-General, Sir F. Pollock, and Mr. Richards.

Several witnesses were called to prove that the invention was new when the patent was obtained. Mr. Russell, a Fellow of the Royal Society of Edinburgh, being called, stated that he was well acquainted with the process of manufacturing iron, and gave, as his opinion, that the hot-air blast was not known previously to the date of the patent; he likewise testified to its usefulness. Other witnesses (amongst whom was Professor Daniel) gave their evidence, confirming the opinion of the former gentleman; but they did not agree as to the capability of an ordinary mechanic to make an apparatus from the description in the specification, available for the application of the hot-air blast.

The Attorney-General contended that Mr. Neilson, in his specification, misled the public as to the size, and did not state the shape of the vessel in which the air was to be heated; that he did not point out the tubular form used by the defendant; but contemplated passing the air through the furnace in a current, as was evident from his using only one vessel for heating the air, and then forcing it into the fire through a pipe or aperture.

The learned Judge then proceeded to sum up. He said the patent appeared to have been originally granted to Mr. Neilson alone, but had been subsequently assigned by him to two other gentlemen, who were now plaintiffs with him in this action. The declaration stated that there was a proviso in the patent that it should particularly describe the invention to be enrolled. He (the learned judge) would express his opinion on the law of the case, and it would be for the Jury to deal with the matters of fact. The first objection was, that the defendants were not guilty of the infringement: secondly, that Mr. Neilson was not the original discoverer of this invention; thirdly, that it was not a new invention, and that the plaintiff was not entitled to the benefit of it because it was known before; fourthly, that the specification was in a certain form which did not truly and accurately describe the nature of the invention, so as to satisfy the proviso on which the letters patent were granted; and fifthly, that the invention so specified had not been of any public use or benefit whatever.

In the first place, then, let them examine whether there had been any infringement of the patent, and he apprehended that there could be no doubt there had, if the specification was free from the objections taken to it. Unquestionably, what the defendants had done was a great improvement on the original invention, but that did not render it the less an infringement. The second objection was, that the patentee was not the true and first inventor of a mode of applying hot air. Now, it appeared, upon the evidence, that none of the witnesses for the plaintiff were aware of any invention similar to this.

---

* For Specification of the Patent, see Vol. VII., Second Series, page 20.

The next plea which they came to, was the important one as regarded the specification, and it would be necessary for him to draw the attention of the Jury to this part of the case particularly. It was contended by the Attorney-General, that the title of the patent rendered it void, because no one would know that it was applicable to the purposes to which the apparatus, now complained of, was applied. His (the Judge's) opinion at present was, that the title of the patent was not defective, and it did not appear to him that the generality of the title would make it bad, and there was no evidence in the case to show that it was not the patentee's own discovery.

As regarded the specification, his impression of the meaning of the part of the specification which related to this point was, that the patentee claimed the invention of heating air in any vessel of any size, providing it was a close vessel, and placed between the blowing apparatus and the fire, forge, or furnace. But when the patentee stated that the form or shape of the vessel was immaterial to the effect required to be produced, he (the Judge) considered that statement an incorrect and untrue one, and, consequently, the patent could not be valid. Nevertheless, he would leave the question to the Jury, but he feared that they could not allow competent and skilful persons to correct the mistakes in the specification. It was true that some effect might be produced by a vessel of any size, but the amount of effect depended entirely on the size of the vessel; and this, in his opinion, was a great defect in the patent, and formed a fatal objection to the specification.

It was also contended that the patent was void, because the mode of constructing the vessel was not clearly pointed out. The patentee, however, claimed the invention of the mode of heating the blast in a vessel exposed to heat, and the specification stated that a person of competent knowledge and ordinary skill would construct such a vessel as would be necessary for the forging of iron. At first sight it would appear the patentee had supposed that in order to answer in blast furnaces, it was only necessary to increase the size. Now, if the Jury were of opinion a person of ordinary skill would adopt this mode by merely looking at the specification, then the specification, as regarded this question, was good, and the objection must fail. They had the evidence certainly before them of one person trying a square box, although they had the evidence of several eminent men to show that it would not answer. One of the gentlemen examined, had told them that in order to adapt the hot blast to the furnace, it would be necessary to introduce a different kind of tuyère, as the tuyères formerly used were liable to be burnt. Now, the specification omitted to mention water tuyères or other protection, and if it was the opinion of the Jury that these tuyères were necessary, then the specification was void, and the objection was a good one. The first witness was Mr. Russell, who was a scientific gentleman, and he said that a judicious person, such as he would select, would be able, under the patent, to make an efficacious apparatus; but the phrase "judicious" persons such as he would select, implied that it required something more than ordinary skill. The last witness (Mr. Cooper) admitted the necessity of the water tuyère to bring the invention to the highest state of perfection; and he also stated that a man might be required to make many experiments before he could bring the apparatus to its present state of completeness. If the Jury were of opinion that a man of ordinary skill would be enabled, under the patent, to construct a valuable apparatus, the specification would not be insufficient. Sir William Follett submitted that the point, as regarded the form and size of vessel to be used, was not contained in the objections furnished to the plaintiffs by the defendants, and it could not therefore be entertained. He (Baron Parke) differed in opinion from Sir William Follett. He considered that the fourth objection, which set forth "that the specification was in a form which did not truly and accurately describe the nature of the invention, so as to satisfy the proviso on which the letters patent were granted,"

was conclusive on this point. The learned Judge then said, that he would put the first question as a matter of form, as it involved a point of law which would remain to be argued and decided elsewhere. He would, therefore, ask the Jury,—Were they of opinion that the shape and form of the vessel were material?

After a short consultation, the foreman said the Jury did not doubt it.

Baron Parke said he thought they could not. The next question was,—Did they think that a man of common understanding and ordinary skill, and possessing a knowledge of the old blowing apparatus, would be able to construct an apparatus, according to the specification, that would be productive of such benefits as would make it worth while to incur the expense of adopting the principle?

The Jury replied, that they were of opinion that a person of ordinary ability, and acquainted with the ordinary blowing machinery, would be able to construct an efficacious apparatus under the specification.

His Lordship said, the next question was,—Whether they believed that a person of ordinary skill, and acquainted with the air-heating apparatus, would correct the error in the specification, which stated that the form and shape of the air-vessel were not material?

The Jury answered, that such a person would, in their opinion, correct the error.

The Jury next found, that Mr. Neilson was the first and true inventor. Thus finding for the plaintiffs on the four principal issues, which would have the effect of establishing his right to the patent; but finding for the defendants, by the direction of the learned Judge, on the point regarding the variance in the specification, with leave to the plaintiffs' counsel to move the court above to have a verdict entered for the plaintiffs.

List of Patents

That have passed the Great Seal of IRELAND, from the 17th April to the 17th of May, 1841, inclusive.

James Jamieson Cordes and Edward Locke, of Newport, in the county of Monmouth, for a new rotary engine.—Sealed 4th May.

John Grylls, of Cumberland-street, Portsea, for improvements in machinery used for raising and lowering weights.—Sealed 4th May.

George Dacres Paterson, of Truro, Cornwall, Esq., for an improvement in curvilinear turning, that is to say, "a rest," adapted for cutting out wooden bowls, and a self-acting slide rest for other kinds of curvilinear turning.—Sealed 18th May.

James Johnson, of Glasgow, Gent., for certain improvements in machinery for themanufacture of frame-work knitting, commonly called hosiery; and for certain improvements in such frame-work knitting or hosiery.—Sealed 18th May.

List of Patents

Granted for SCOTLAND, subsequent to April 22nd, 1841.

To Ezra Jenks Coates, of Bread-street, Cheapside, in the city of London, merchant, for improvements in the forging of bolts, spikes, and nails,—being a communication from a foreigner, residing abroad.—Sealed 28th April.

John Watson, of Glasgow, in the Kingdom of Scotland, merchant, for improvements in printing fabrics, where discharging presses are used.—Sealed 28th April.

John Haughton, of Liverpool, Clerk, M. A., for improvements in the means employed for preventing railway accidents resulting from one train overtaking another.—Sealed 28th April.

James Ransome and Charles Man, of Ipswich, in the county of Suffolk, machine-makers, for improvements in the manufacture of railway chairs, railway and other pins or bolts, and in wood fastenings, and trenails.—Sealed 28th April.

Peter Fairbairn, of Leeds, in the county of York, engineer, and William Suttill, of the Town of Newcastle-upon-Tyne, flax spinner, for certain improvements in drawing flax, hemp, wool, silk, and other fibrous substances.—Sealed 28th April.

William Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for improvements in spinning and twisting cotton and other materials capable of being spun and twisted,—being a communication from abroad. —Sealed 30th April.

Thomas Robinson, of Wilmington-square, in the county of Middlesex, gent., for improvements in drying wool, cotton, and other fibrous materials, in the manufactured and unmanufactured state,—being a communication from abroad.—Sealed 30th April.

Lancelot Powell, of Clydach Works, in the county of Brecon, iron-master, and Robert Ellis, of Clydach aforesaid, agent, for improvements in the manufacture of iron.—Sealed 5th May.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for certain improvements in the process or method of manufacturing lime, cement, mastic, artificial stone, stucco, and other similar compositions possessing the useful properties of hardness, colour, and indestructibility when exposed to damp,—being a communication from abroad.—Sealed 7th May.

David Walther, of Angel-court, Throgmorton-street, in the city of London, merchant, for certain improvements in the methods of purifying vegetable and animal oils, fats, and tallows, in order to render those substances more suitable for soap-making, or for burning in lamps, or for other useful purposes; part of which improvements are also applicable to the purifying of the mineral oil, or spirit commonly called petrolium or naptha, or coal tar, or spirit of coal tar,—being a communication from abroad.—Sealed 7th May.

James Whitelaw and George Whitelaw, engineers, residing in Glasgow, in the county of Lanark, Scotland, for a new mode of propelling vessels through the water, with certain improvements in the steam-engines when used in connection therewith; parts of which improvements are applicable to other useful purposes.—Sealed 10th May.

Thomas Lawes, of Canal Bridge, Old Kent-road, in the county of Surrey, feather factor, for certain improvements in the method or process and apparatus for cleansing and dressing feathers,—being partly a communication from abroad.—Sealed 10th May.

Angier March Perkins, of Great Coram-street, in the county of Middlesex, engineer, for improvements in apparatus for heating by the circulation of hot water, and for the construction of pipes or tubes for such and other purposes.—Sealed 12th May.

George Dacres Paterson, of Truro, in the county of Cornwall, Esq., for improvements in curvilinear turning,—that is to say, "a rest," adapted for cutting out wooden bowls; and a self-acting slide rest for other kinds of curvilinear turning.—Sealed 12th May.

William Kenworthy, of Blackburn, in the county of Lancaster, spinner, and James Bullough, of the same place, overlooker, for certain improvements in machinery or apparatus for weaving.—Sealed 17th May.

Christopher Dumont, of Mentz, in the Kingdom of Germany, but now of Mark-lane, in the city of London, for improvements in the manufacture of metallic letters, figures, and other devices,—being a communication from abroad.—Sealed 17th May.

John Paley, junior, of Preston, in the county of Lancaster, manufacturer, for certain improvements in looms for weaving.—Sealed 20th May.

New Patents

SEALED IN ENGLAND.

1841.

To James Sims, of Redruth, Cornwall, civil engineer, for certain improvements in steam-engines.—Sealed 29th April—6 months for inrolment.

Alfred Jeffery, of Prospect-place, New Hampton, Middlesex, gent., for a new method of defending the sheathing of ships, and of protecting their sides and bottoms.—Sealed 29th April—6 months for inrolment.

George Townshend, of Sapcote Fields, Leicester, Esq., for improvements in machinery or apparatus for cutting certain vegetable substances.—Sealed 29th April—6 months for inrolment.

Joseph Gibbs, of Kennington, civil engineer, for a new combination of materials for making bricks, tiles, pottery, and other useful articles; and a machine or machinery for making the same; and also a new mode or process of burning the same, which machine or machinery, or mode or process of burning, are also applicable to the making and burning of other descriptions of bricks, tiles, and pottery.—Sealed 29th April—6 months for inrolment.

Miles Berry, of the Office for Patents, 66, Chancery-lane, patent agent, for certain improvements in machinery or apparatus for making or manufacturing nails and brads, —being a communication.—Sealed 4th May—6 months for inrolment.

Francis Joseph Massey, of Chadwell-street, Middleton-square, watch manufacturer, for improvements in the method of winding up watches and other time-keepers—Sealed 4th May—6 months for inrolment.

Edward Newton, of Leicester, manufacturer, and Thomas Archbold, of the same place, machinist, for improvements in producing ornamental or tambour work, in the manufacture of gloves.—Sealed 4th May—6 months for inrolment.

Charles Thomas Holcombe, of Bankside, Southwark,—iron merchant,—for certain lubricating or preserving matters, for wheels and axles; applicable also to the bearings, journals, or other parts of machinery.—Sealed 4th May—4 months for inrolment.

Hugh Graham, of Bridport-place, Hoxton, artisan, for an improved manufacture of that kind of carpeting usually denominated Kidderminster carpeting.—Sealed 4th May—2 months for inrolment.

Moses Poole, of Lincoln's-Inn, Esq., for improvements in the manufacture of fabrics by felting,—being a communication.—Sealed 6th May—6 months for inrolment.

Philemon Augustine Morley, of Birmingham, manufacturer, for certain improvements in the manufacture of sugar moulds, dish covers, and other articles of similar manufacture.—Sealed 6th May—6 months for inrolment.

James Hancock, of Sidney-square, Mile End, civil engineer, for certain improvements in the manufacture of locks, keys, latches, and other fastenings, part of which improvements are applicable to taps and cocks, for drawing off fluids.—Sealed 6th May—6 months for inrolment.

John Paley junior, of Preston, Lancaster, manufacturer, for certain improvements in looms for weaving.—Sealed 10th May—6 months for inrolment.

Hooton Deverill, of Nottingham, lace manufacturer, for certain improvements in machinery for making and ornamenting lace, commonly called "bobbin net lace."—Sealed 10th May—6 months for inrolment.

Andrew Mc Nab, of Paisley, North Britain, engineer,

for certain improvements in the manufacture of bricks.—
—Sealed 11th May—4 months for inrolment.

Edmund Tayler, of King William street, London, Gent., for certain improvements in the construction of carriages used on railroads,—being a communication.—Sealed 11th May—6 months for inrolment.

Henry Pinkus, of Maddox-street, Hanover-square, for an improved method or methods of applying electrical currents or electricity, either frictional, atmospheric, voltaic, or electro magnetic.—Sealed 14th May—6 months for inrolment.

James Gregory, coal master, and William Green, tinner, both of West Bromwich, Stafford, for certain improvements in the manufacture of iron and steel.—Sealed 14th May—6 months for inrolment.

Pierre Journet, of Dean-street, Soho, engineer, for improvements in fire escapes, which improvements are applicable to other useful purposes.—Sealed 19th May—6 months for inrolment.

John Carr, junior, of Paddington, engineer, for improvements in apparatus for retarding and stopping railway carriages.—Sealed 20th May—6 months for inrolment.

Charles Phillips, of Chipping Norton, Oxford, engineer, for improvements in reaping and cutting vegetable substances as food for cattle.—Sealed 20th May—6 months for inrolment.

Joseph Woods, of Lawn-place, Lambeth, civil engineer, for certain improvements in locomotive engines, and also certain improvements in machinery for the production of rotatory motion, for obtaining mechanical power; which improvements in machinery are also applicable for raising or impelling fluids.—Sealed 22nd May—6 months for inrolment.

William Gall, of Beresford-terrace, for an invention of certain improvements in the construction of ink-stands,—being a communication.—Sealed 22nd May—6 months for inrolment.

John Ainslie Farmer, Redheugh, North Britain, for a new and improved mode of making or moulding tiles, bricks, retorts, and such like work, from clay and other plastic substances.—Sealed 22nd May—4 months for inrolment.

Christopher Dumont, of Mark-lane, London, for improvements in the manufacture of metallic letters, figures, and other devices,—being a communication.—Sealed 22nd May —6 months for inrolment.

John Winterborn, of Clarence-place, Hackney-road, surgeon, for improvements in machinery to facilitate the removal of persons and property from premises in case of fire; which improvements are applicable to raising and lowering weights generally, to assist servants cleaning windows, and as a substitute for scaffolding.—Sealed 22nd May —6 months for inrolment.

William Lewis Rham, of Winkfield, Berks, clerk, for certain improvements in machinery or apparatus for preparing land, and sowing or depositing grain, seeds, and manure.—Sealed 25th May—6 months for inrolment.

John Whitehouse, of Deptford, engineer, for an improved method of making boilers, to be used in marine steam-engines.—Sealed 25th May—6 months for inrolment.

William Joest, of Ludgate-hill, merchant, for improvements in propelling vessels,—being a communication.—Sealed 26th May—6 months for inrolment.

George Hulme, of St. John street, West Smithfield,—cock founder, for improvements in water-closets.—Sealed 27th May—6 months for inrolment.

Joseph Bettridge, of Birmingham, wood turner, for an improved method of manufacturing papier maché, pearl, china, ivory, horn, wood, and composition, into pillars and stands for table and other lamps, and other articles of domestic furniture.—Sealed 27th May—6 months for inrolment.

James Shanks, of St. Helens, Lancashire, chemist, for improvements in the manufacture of carbonate of soda.——Sealed 27th May—6 months for inrolment.

CELESTIAL PHENOMENA FOR JUNE, 1841.

D.	H.	M.	
1			Clock after the sun, 2m. 32s.
—			☽ rises 5h. 54m. A.
—			☽ passes mer. 10h. 6m. A.
—			☽ sets 1h. 47m. M.
2			Occul *b* Scorpii im. 11h. 7m. em. 11h. 33m.
	14		♃'s first satt. will im.
3	16	56	♀ stationary.
	20	30	♃ in conj. with the ☽ diff. of dec. 4. 50. N.
4	3	42	Ecliptic oppo. or ○ full moon
	—		Occul 3 Sagittarii im. 15h. 6m. em. 16h. 20m.
5			Clock after the sun, 1m. 54s.
—			☽ rises 10h. 0m. A.
—			☽ passes mer. 0h. 40. M.
—			☽ sets 4h. 4m. M.
	2	42	♄ in conj. with the ☽ diff. of dec. 4. 19. N.
	10	16	♃ in oppo. with the ☉
6	18	53	☿ greatest hel. Lat. N.
7	4		☽ in Apogee.
7			Occul 4 Capri. im. 12h. 6m. em. 12h. 22m.
8			Occul θ Capri, im. 12h. 37m. em. 13h. 31m.
10			Clock after the sun, 0m. 53s.
—			☽ rises 11h. 48m. A.
—			☽ passes mer. 4h. 34m. M.
—			☽ sets 9h. 45m. M.
10	0	29	Pallas in □ with the ☉
11	12	33	♃'s first satt. will em.
12	5	54	Her: in conj. with the ☽ diff. of dec. 4. 53. S.
	7	58	☽ in □ or last quarter.
14	9	44	♃'s second satt. will em.
15			Clock before the sun, 0m. 3s.
—			☽ rises 0h. 42m. M.
—			☽ passes mer. 8h. 12m. M.
—			☽ sets 4h. 1m. A.
	3	4	Her: in □ with the ☉
	7	50	Juno in □ with the ☉
16	6	29	♀ in conj. with the ☽ diff. of dec. 8. 23. S.
18			Mercury R.A. 7h. 25m. dec. 23. 46. N.
—			Venus R. A. 3h. 8m. dec. 14. 23. N.

D.	H.	M.	
	—		Mars R. A. 13h. 15m. dec. 8. 40. S.
	—		Vesta R. A. 1h. 23m. dec. 2. 0. N.
	—		Juno R. A. 11h. 50m. dec. 7. 0. N.
	—		Pallas R. A. 23h. 0m. dec. 9. 50. N.
	—		Ceres R. A. 1h. 16m. dec. 2. 40. S.
	—		Jupiter R. A. 16h. 48m. dec. 21. 43. S.
	—		Saturn R. A. 18h. 0m. dec. 22. 23. S.
	—		Georg. R. A. 23h. 40m. dec. 2. 58. S.
	—		Mercury passes mer. 1h. 39m.
	—		Venus passes mer. 21h. 20m.
	—		Mars passes mer. 7h. 28m.
	—		Jupiter passes mer. 11h. 1m.
	—		Saturn passes mer. 12h. 11m.
	—		Her. passes mer. 15h. 52m.
19	7	15	Ecliptic conj. or ● new moon.
	17		☽ in Perigee.
20			Clock before the sun, 1m. 8s.
	—		☽ rises, 4h. 34m. M.
	—		☽ passes mer. 1h. 19m. A.
	—		☽ sets 9h. 46m. A.
	4	15	♀ at greatest brilliancy.
	11	31	☿ in conj. with the ☽ diff. of dec. 0. 3. N.
	22	7	♄ in oppo. with the ☉
21	3	34	☉ enters Cancer; Summer commences
	12	19	♃'s second satt. will em.
25			Clock before the sun, 2m. 12s.
	—		☽ rises 11h. 50m. M.
	—		☽ passes mer. 5h. 44m. A.
	—		☽ sets 11h. 23m. A.
	10	37	☽ in □ or first quarter.
27	0	39	♂ in conj. with the ☽ diff. of dec. 4. 31. N.
27	10	51	♃'s first satt. will em.
29	4	0	Her: stationary.
	16	41	☿ greatest elong. 25. 49. E.
30	6	58	☿ in the descending node.
	20	28	♃ in conj. with the ☽ diff. of dec. 4. 59. N.

J. LEWTHWAITE, Rotherhithe.

THE

London

JOURNAL AND REPERTORY

OF

Arts, Sciences, and Manufactures.

CONJOINED SERIES.

No. CXV.

Recent Patents.

To Charles Wye Williams, *of Liverpool, in the county of Lancaster, gent., for certain improvements in the construction of furnaces and boilers.*—[Sealed 17th November 1840.]

This invention consists, firstly, in a novel and peculiar mode, by which heat may be transmitted with increased rapidity, and in large quantities, through the plates of which boilers, stills, or refrigerators are constructed; and secondly,—in the adoption of such mechanical arrangements as will perform the operation of charging furnaces with fuel more uniformly than is practicable by manual labour, and by which the formation of clinkers is prevented.

The objects of the first part of this invention, being to transmit heat with the greatest rapidity and in the largest quantity, to or from water, or other liquids, to be heated,

evaporated, or cooled, is effected by inserting into the plates, of which boilers, stills, pans, or refrigerators are formed, or the flues, tubes, or pipes, belonging to the same, a number of metallic pins or conductors, through, and by means of which, heat may be conducted in much greater quantities than is practicable where the action of such heat, or the heated products of combustion, are confined to the surfaces of such plates or tubes.

These metallic conductors may be made of iron, copper, brass, or other metal, and of such length and thickness, and distances apart, as the nature of the plates in which they are inserted, and of the liquid to be heated or cooled, may render advisable. In iron-plate boilers, for the generation of steam, these conductors may be from four to six inches long, and from one-half to three-quarters of an inch thick, and placed about two to three inches apart. The portion of such conductors, which projects into the flue to receive the heat, being about two-thirds of the length, and that which projects into the water, to give out the heat so transmitted, being about one-third.

In the case of locomotive engines, these conductors should be more numerous, and about one-quarter of an inch in thickness, and of proportionate length, and made of copper or brass, as those metals have a high conducting power; but it may be desirable to vary the proportions here mentioned, according to the nature and thickness of the material through which the heat is to be transmitted, or the liquid or vapour to be heated or cooled.

This mode of conducting heat by conduction, longitudinally through metallic pins or bars, is applicable to all operations in which a heating, cooling, or condensing process is required, as in the case of refrigerators or condensers for vapours or gases; or of evaporative pans, or in any of the operations of distillation; or boiling in close or

open vessels. The various modes, however, of applying those conductors, are sufficiently obvious not to require enumeration.

Where the fluid or vapour, to be acted on, is likely to adhere to the conductors, they may be plated, tinned, or coated with other metal not subject to corrosion, incrustation, or oxidation. These conductors may be fixed in the plates or tubes, in the nature of screws or rivets, or driven into drilled or punched holes, or by any of the other well-known means. Where, however, the liquid is to be evaporated to dryness, or to the state of crystallized saline or earthy matter, as in the evaporation of alkaline compounds; or where the projection of the conductors might interfere with the process of mixing or agitating the liquids to be evaporated,—in such cases, any projection of the conductors inwards, is avoided.

Where the evaporative pan or boiler is made of cast-iron, these conductors may be of the same material, and cast solid with it.

The second part of the invention consists in so constructing the bars of a furnace, and giving them a peculiar longitudinal and alternating motion, that the fuel may be urged forward into the body of the furnace. These bars being made to project beyond the body of the furnace, receive the fuel as it descends from a hopper; while, by the motion described, a uniform supply is given; and, consequently, a uniform quantity of combustible gaseous matter is evolved from such fuel. The following will describe some of the modes by which the above purposes are effected:

Plate XV., fig. 1, represents a section of a land-engine boiler, shewing one of the modes of inserting the metallic conductors. *a, a,* represent the conductors; the larger portions of which project into the flue to receive the heat, and the shorter portions into the fluid, to give it out. For

the purpose of refrigerating, this arrangement may be altered, by allowing equal portions to project on each side, or by exposing the longer end to the cooling action of the liquor, to increase the rapidity of the abstraction of heat.

Fig. 2, is a portion of an evaporative pan, in which the conductors are of the same material as the pan, and are cast solid with it.

Fig. 3, represents a side view of a furnace, with the bars and hopper, as already described. *b, b,* are the bars; *c,* the hopper; *d,* the centre or working shaft, by which the cams or excentrics *e, e,* are made to revolve, and by which, motion is conveyed to the bars. This shaft may be moved by hand power, or connected with the steam-engine or other prime mover, and made to revolve at whatever speed may be found most desirable;—one revolution of the excentrics, every two minutes, having been found to be a useful rate of going. This, however, will depend on the nature of the fuel and the length of the bars. *f,* is a cross bearer, on which the bars rest, as on a fulcrum, and in a hollow left in the under side of the bars; *g,* is a sliding door or trap in the hopper, by which the supply of coals may be cut off when requisite; *h,* the ordinary fire-door, through which the fuel is introduced when the fires are first lighted; *i,* is a second sliding door, by which any small coal, that falls through, may be occasionally withdrawn. In cases where it may be advisable to increase or diminish the quantity of coals to be used, or give an increased activity to the fires,—this may be effected by increasing the speed at which the excentrics *d,* revolve; or by lowering the further end of the bars, so as to give them a greater incline; and where the furnace or grate may be wider than the entrance door, one or more bars, on each side, may be made stationary, as in ordinary furnaces, as there will always be a sufficient tendency in the fuel to

spread laterally, and keep such stationary bars covered with a sufficient body of fuel; it being essential, to perfect combustion without smoke, that the fuel be uniformly spread, and from six to eight inches thick on every part.

Fig. 4, represents another mode of adjusting the moving shaft *d*, and the excentrics *e*; and which mode is desirable with coals that cake and consolidate on the bars. In this case, the lower ends of the bars, resting on friction rollers *k*, receive both a vertical and horizontal motion, similar to that of the excentric rod of the steam-engine, by which the caked mass of fuel is broken up and urged onward to the ends of the bars.

Fig. 5, represents sections of one of the bars, drawn on a larger scale, and taken at the widest and shallowest parts, at *m*, and *n*,—the former presenting a wedge-shape, and the latter being flat on the upper edge.

It will here be observed, that the highest part of each division of the bars corresponds with the lowest part of those next adjoining; and by which the solid body of coal is more effectually broken up and kept in motion.

Figs. 6, 7, and 8, shew other modes of adjusting the excentrics, to produce the positions of the bars in figs. 9, 10, and 11.

Fig. 12, shews a mode of increasing the length of the fire-surface, where it may be desirable, beyond what would be a convenient length for the moveable bars. This is effected by a supplemental set of fixed bars *l*; at the end of which may be placed, if necessary, an ordinary clinker trap.

Figs. 13, 14, and 15, represent the metallic pins or rods, without conductors, inwards, used when the liquid, in the boiler, is to be evaporated for crystallization. These rods are fastened to the boiler by a rivet-head. Another mode of forming these metallic conductors, by casting them with the boiler or evaporating pan, is shewn at figs. 16 and 17.

The patentee claims the exclusive use and application of metallic pins or rods, as conductors, for transmitting heat; and by which means the flame or products of combustion may be urged directly against such conductors, whereby more heat is received and transmitted than if they merely impinged or passed along the surface of the boiler plates, as in the ordinary construction.

And as the giving motion to the bars of furnaces has already been practised in several ways, he makes no claim to such; but he claims giving the peculiar longitudinal and vertical motions, herein described, to the bars of a furnace; and also of projecting such bars astride such furnace, by which means they are not only enabled to receive the coals, falling from the hopper, but also urge them onward with a diminishing force and motion, as they proceed towards the furthest and lowest ends.—[*Inrolled at the Petty Bag Office, May,* 1841.]

To EDWIN HOARE, *of Stonehouse, in the county of Gloucester, clothier, for a method of preventing the darkness of colour which frequently occurs near the list, as compared with the colour of the middle of woollen cloths, in the process of heating them in water, or by steam, on rollers.*—[Sealed 1st October, 1835.]

IN Plate XV., fig. 1, A, is a hollow cylinder of cast-iron; B, and C, are two short cylinders of wood, one at each extremity of A, and, externally, of exactly the same diameter; E, and F, are cylindrical parts of B, and C, respectively, a little smaller in diameter than the internal diameter of the cylinder A, and contained within it, as represented by the dotted lines; D, is a round wrought-iron bar, about one

inch in diameter, passing through the centre of the cylinder of iron, and end cylinders of wood, and caps of iron G, and H, to keep them together in their places, so as to form, altogether, one smooth cylinder externally; and for this purpose D, has a head at one end, and a nut and screw at the other.

The end cylinders B, and C, and the iron caps G, and H, have each two holes, of about an inch in diameter, through them, (figs. 2 and 3,) so as to form communications with the inside of the cylinder or roller, nearly parallel with the axis D, for the purpose of allowing water or steam to pass into and out of the space within the roller surrounding D.

The diameter of the iron of the roller may be varied, so as to be made larger. The greater the quantity of cloth to be rolled upon it—for instance, a piece of cloth, of forty yards, would require a roller of a larger diameter than an end of cloth of twenty yards; and the length of the roller should be adapted to the width of the cloth to be rolled upon it; for instance, a piece of broad cloth will require a longer roller than a cassimere. The wooden ends of the roller, however, should be of such a length, in proportion to the width of the cloth, that about two nails of the cloth, within each list, shall be wound upon the wood, while the rest of the cloth, within the lists, shall be wound upon the iron. Several kinds of wood may be employed, but foreign birch is preferable. The process of winding the cloth upon the roller, and that of heating it afterwards, are commonly known in the clothing business.

The patentee claims the described combination of wood and iron in rollers for woollen and other cloths, to be submitted, when rolled upon them, to the process of heating.—[*Inrolled in the Rolls Chapel Office,* 1836.]

To George Augustus Kollman, *organist of Her Majesty's German Chapel, St. James's Palace, for his invention of improvements in railways, and in locomotive carriages.*—[Sealed 23rd April, 1836.]

The object of these improvements, is to prevent locomotive carriages running off the lines of rails; and for that purpose, the patentee attaches a perpendicular arm or bracket to the under part of his carriage, which is furnished with anti-friction rollers, that bear laterally against a central rail, placed upon the ground, along the middle of the line, between the two parallel rails of the road.

There are two modes proposed; the one is by forming a trench below the surface of the ground, and allowing the anti-friction rollers to act against the sides of this trench; the other, by raising the guide-rail above the ground, and applying a roller to act on each side of it.

Plate XVI., fig. 1, represents the first-mentioned mode of guiding the rail-road carriage. A perpendicular arm *a*, extends from the under part of a rail-road carriage; to which arm, as an axle, a horizontal wheel, or anti-friction roller *b*, is attached. A parallel trench, shewn in section at *c*, *c*, is cut in the ground, along the middle of the railway, extending its whole length. The sides of the trench are formed by plates of iron; and on the tops of these plates are flanges *d*, *d*. The roller *b*, acts in the trench, and runs against its sides as the carriage passes along, thereby keeping the carriage, at all times, in the proper direction, and restraining its wheels from running off the rails; the flanges at top also prevent the carriage from rising, in the event of any accidental interruption.

The second mode of confining the carriage, is shewn at fig. 2. *a*, is the perpendicular rod, extending from the

under part of the carriage. This rod has a bracket or frame *e*, *e*, in which are mounted anti-friction rollers *b*, *b*, acting against the sides of a vertical rail *c*, fixed securely on the ground, along the middle of the railway. As the carriage advances, the rollers *b*, *b*, bearing laterally against the sides of the rail *c*, confine the direction of the carriage, and prevent its wheels running off the parallel rails; the flange *d*, at top of the rail, also prevents the carriage from rising.

In order to guide the carriage correctly in its forward course, there are to be two wheels *b*, placed at some distance one before the other; which, by both acting in the trench, will preserve the parallel position of the carriage, should it be, from circumstances, at any time inclined to deviate. In the contrivance, shewn at fig. 2, there are also to be two pairs of wheels *b*, *b*, placed under the carriage, the one pair in advance of the other, for the purpose of regulating its direction.

These anti-friction rollers are proposed to be attached to the carriage by a forked frame, shewn in the horizontal view, at fig 3, which will be clearly understood without further description.

In conclusion, the patentee says, "that he is aware anti-friction rollers have been before applied to railway carriages, and used against the sides of a vertical rail, for the purpose of confining the direction of the carriage, and preventing its passing off the rails; he therefore merely claims the top flanges, to prevent the carriage rising; and also the forked frame-work, by which the anti-friction wheels are attached."—[*Inrolled in the Inrolment Office, October,* 1836.]

To GEORGE AUGUSTUS KOLLMAN, *organist to Her Majesty's German Chapel, St. James's Palace, for improvements in railways, and in locomotive and other carriages.*—[Sealed 17th August, 1839.]

THE subjects of this specification are improvements upon the preceding patent of 1836, and consist of two features; the first,—a mode of enabling a railway carriage to ascend inclined planes with facility, by the ordinary power of the steam-engine; the second,—an improved construction of framing, for supporting the carriage upon its springs, by which the locomotive carriage will be enabled to run freely upon curves in the line of rail-road; or, if constructed for ordinary roads, to lock or turn with facility.

The mode of ascending inclined planes, is effected by placing wooden rails at the sides of the ordinary iron rails of the road where the line ascends; which wooden rails, by standing higher than the iron rail, come in contact with a rim at the side of the wheel, of smaller diameter than the periphery of the wheel.

Plate XVI., fig. 4, represents a transverse section of an iron rail *a*; the additional wooden rail *b*, which extends along the side of the iron rail, and is a few inches higher; the ordinary running wheel *c*; and the additional rim *d*, of smaller diameter, affixed to the side of the running wheel.

Where the inclined plane of the road extends, these additional elevated wooden rails are to be placed, in order that, by the smaller diameter of the wheel coming into contact, at those parts of the road, with the surface of the rail, the propelling power of the engine may be more beneficially exerted, and the carriage thereby impelled with increased power.

The contrivance for locking the wheels of the carriage,

consists in mounting the running wheels in two rectangular frames, with springs, each frame being distinct from the other; and these frames are connected to the body of the carriage by circular vertical stems, fixed under the carriage, which fit into circular sockets in the frames, and thereby form joints or pivots. By these means, whenever the fore and hind wheels of the carriage are required to assume an angular position to each other, as in passing curves or turning corners in the road, the frames are enabled to turn horizontally, by the sockets moving round on the circular stems, which will prevent the drag and friction against the rails, or against the ground, that would take place if the wheels were made to retain their parallel positions.—[*Inrolled in the Inrolment Office, February,* 1840.]

To George Edward Noone, *of High Holborn, engineer, for certain improvements in pumps, and in engines for drawing beer, cider, and other fluids.*—[Sealed 3rd August, 1840.]

This invention of certain improvements in pumps and engines for drawing beer, cider, and other fluids, consists, in the first place, in the application of a rotary stuffing-box to pumps, or machines, or engines, used for such purposes; secondly,—a kind of flexible joint, to be substituted for stuffing-boxes to such pumps or machines; thirdly,—a peculiar application of flexible material, to answer the purpose of a stuffing-box, when rectilinear motion is used; fourthly,—a mode of covering the lower part of the pump, (or beer or other engine); by which, access to the lower valve may be readily obtained, in case of need; and lastly,—a mode of regulating the rectilinear action of the piston-

rod, with a guide for such purpose, capable of easy adjustment. These improvements will be readily seen, on reference to Plate XVI.

Fig. 1, is a vertical section of an ordinary form of pump, exhibiting the rotary stuffing-box, which is shewn at *k*; *m*, is the centre or fulcrum, upon which the working handle or lever *l*, turns; *n*, is a plate, screwed into the interior of the pump, and enclosing the material (flexible or otherwise) which forms the packing.

Fig. 2, is a plan or horizontal view of the connection between the forked end of the handle or lever *l*, and the lever *j*. On the end of the latter lever is formed a screw, by which it is united to the small wheel or disc *x*; this wheel has the pin *y*, passing through its centre, which passing through the forked end of the lever *l*, forms the junction of the two levers; the space left in the box, containing the disc or wheel *x*, is filled up by any ordinary packing material.

Fig. 3, shews a kind of flexible joint, to be substituted for a stuffing-box. In this case, the lever to be connected with the piston-rod is to be formed in one piece, with the working lever *l*. The flexible material *d*, is attached to the lever *j*, at *b*, and is fixed, at its two ends, into the sides of the pump-barrel, in the present supposed position of the working lever *l*. The portion of the flexible material on one side of the lever *j*, undergoes a degree of tension, that on the other side being loose, the lever *l*, being brought to the opposite position in working, the reverse is the case, as regards the flexible material. *p*, is a cap, to be screwed on to the lever *j*, for the purpose of keeping the flexible material tightly in its place, and also for forming a connection between the lever *j*, and the piston-rod. Another application of the flexible material, to answer the purpose of a stuffing-box, when rectilinear motion is used, may be

seen at fig, 4, which is a section of a portion of a pump-barrel, having in its upper part a plate *c*, to which is fixed one end of the flexible material *d*, the other end being attached to the hollow piston-rod *a*; which, on receiving an up-and-down motion, through its connection with the handle or lever *l*, draws the flexible material into tension, or compresses it.

A mode of covering the lower part of the pump, by which access to the lower valve may be readily obtained in case of need, is shewn at fig. 1. By unscrewing the flange of the cap *e*, it may be slidden up the pump-barrel; thus affording a facility for getting at the lower valve, if required.

The mode of regulating the rectilinear action of the piston-rod, with an easily-adjustable guide, is likewise shewn in the same figure. *f*, is the bracket of an ordinary lift-pump; *g*, the piston-rod, working in the guide *h*. This guide consists of a ring, formed conically, so as to drop into its place in the pump-barrel, and has a kind of bridge formed across it, through which the piston-rod works; *i*, is a sling, for keeping the motion of the piston-rod parallel during the working of the lever *l*.

The patentee states, "that he does not mean or intend to confine himself to the precise forms or arrangements shewn, as the same might be varied, as to matters of detail, with advantage, to suit certain circustances, without departing from the principles set out, under five heads, in the commencement of the specification."—[*Inrolled in the Rolls Chapel Office*, 1841.]

To JOHN JONES, *of Westfield-place, Sheffield, for a new frying and grilling pan, for the cooking of steaks and other meats.*—[Sealed 25th April, 1839.]

THE present improvement consists in adapting, attaching,

or applying raised ribs, bars, studs, or other projections, to the inside bottom of frying or grilling pans, whereby the meat is cooked in a more easy, expeditious, and economical manner, than in the frying or grilling pans now in use.

In the drawing, accompanying the specification, the patentee has shewn two or three different methods of carrying out his invention, consisting in various modes of applying, forming, and attaching, the projecting parts; which may be made either of straight longitudinal raised bars, extending across the bottom of the pan; or they may be indented or wavy on their upper edge, so as to present but few points of contact to the meat placed thereon; or, instead of having long bars, extending across the whole width or length of the pan, the projections may be made of short raised bars, suitably arranged, so as to prevent the meat from touching the bottom of the pan; projecting studs or pins, formed on the bottom, may be also employed, and will answer the same purpose. The patentee states, likewise, that he sometimes employs a moveable frame, consisting of horizontal bars, suitably arranged; such framing fitting into the bottom of the pan, and may be moved therefrom when required.

The advantages obtained from using this pan are, firstly, the convenience in not waiting until a clear fire is made, as the solid bottom of the pan prevents the meat from being spoiled by smoke; and secondly, the said solid bottom prevents a strong fire from injuring the meat by giving out too intense a heat, and thereby the meat is cooked more regularly; and also the fat or dripping, that falls from the meat, runs into a circular groove, formed round the bottom, and may be poured out therefrom and preserved if required, instead of letting it drop into the fire, as is commonly the case.

The patentee claims " attaching or applying raised bars,

studs, or other projections, to the bottom of a pan for supporting the meat, in whatever way the said bars, studs, or other projections may be applied.—[*Inrolled in the Inrolment Office, October*, 1839.]

To THOMAS ROBINSON WILLIAMS, *of Cheapside, in the city of London, gent., for certain improvements in measuring the velocities with which ships or other vessels or bodies move in fluids; and also for ascertaining the velocities of fluids in motion.*—[Sealed 27th August, 1840.]

THIS invention consists in several different arrangements of apparatus, adapted to the various circumstances under which moving bodies have relation to the fluids in which they move.

The arrangements which apply particularly to ships, are first described for river navigation, where the cargo is not liable to great fluctuation in weight; and the perpendicular height of the vessel as regards the water line, evenness of keel, is less disturbed than in sea navigation.

A bent copper tube is used, (see Plate XVI.,) A, B, fig. 1, inserted either through the stern-post or keel, or by the side of either of them, and passed down the stern-post to near its heel; and then, being bent backward, that is, in a direction contrary to the bows or head of the vessel, and made to point rather below or under the rudder, projecting but a short distance from the stern-post, according to its size, and should be merely of sufficient length to be clear of the dead water;—behind the post or keel, this end is left open to the water. The inner end is then bent upwards through the floor of the room or cabin *a*, where a

float-bob, of light hollow glass or metal, with a rod *b*, attached, provided with a scale, similar to common guages for steam, &c.; or, when the water line is not inconveniently low, a strong glass tube is made to form the upper part of this tube, including the water line; that is, the point to which the water will rise when the vessel is not in motion; this then becomes the zero point upon the scale, and with whatever velocity the vessel sails in a forward direction, produces a partial exhaustion of the water from this tube, or a depression of its surface therein; and, consequently, indicates the speed with very great accuracy.

Attached to this main, is a bent glass tube, the two ends being upwards, and one of them connected with the main, the other open to the atmosphere. This bent tube, being partially filled with mercury, and having a scale attached, indicates the velocity by the surface of mercury, in the proportions of the weight of mercury to that of water. To remedy the inconvenience, however, on this principle of the fluctuations of the weight of cargo, a water cistern C, one, two, or three feet square, may be provided, and of sufficient depth; which (placed as near midships, and over the keel, as possible,) has small and safe external communications *c*, *c*, through the vessel, into which the water may flow in and out, that its surface may always correspond with the external water line. Within this box or cistern, another flat hollow metallic or other box *d*, is made to float, but so as to sink considerably below the surface of the before-mentioned cistern. Through the bottom of this float, is firmly soldered or fixed, either the single or bent tube, with its scale, connected by a flexible India-rubber tube *e*, with the before-mentioned main A, B.

Another apparatus to ascertain the velocity of ships, in sea or river navigation, whether by wind or steam, consists of an instrument, suspended by an universal joint in any

convenient part of the vessel, such as the companion-way, or captain's room, and a plummet or drag, or a drag chain, or line, &c., to be towed overboard, and attached thereto, as hereinafter described.

Fig. 2, is a view of the apparatus, with its outer case removed; and fig. 3, the various plummets or drags, used with this and the hereafter-described instruments. At fig. 2, A, is an iron cylinder or chamber, of about one and a quarter inch internal bore, and eighteen inches in length, connected by the small bent tube 1, with the glass tube B, which is cemented into the socket 2, with its upper end open to the atmosphere; C, the wood-work for supporting the internal parts; D, is a plunger, of hollow glass or other material, with the bottom end closed, and made to slide very freely in the iron chamber A; E, is the standard by which the whole is supported and secured to the wood-work of the room or cabin; F, a circular ring, within the arch 3, of the standard E, which, with the screw-pivots 4, 5, 6, and 7, form the universal joint for preserving the perpendicularity of the instrument.

In the standard E, is a finely-adjusted pulley 8,—and 9, another such pulley; 10, the cap of the plunger D, from which projects an ear or staple, to which a strong flexible silk cord is fastened, which passes over the pulley 9, and thence over the pulley 8; G, is the scale on which the knots per hour are graduated; O, is the zero point upon this scale, level with which line, and that intersecting 11, on the iron cylinder A, the mercury stands, when the plunger is in its place, and floating at liberty upon the surface of the mercury.

It will now be seen, that when the cord 12, is pulled, the column of mercury, in the glass tube B, as well as in that of A, will rise by the descent of the plunger, and con-

sequent displacement of the mercury,—and this in an equal ratio, as the degree of tension is increased.

The drag, to be towed overboard, for occasioning the resisting power, (which resistance will always correspond with the velocity of the vessel,) and for operating upon the instrument, as represented by the line 12, 12, fig. 1, connected therewith, may be of various kinds as well as shapes.

For measuring currents or small velocities, and in shallow water, a plain braided rope, of 100 feet or more in length, and of the size of the common log-line, will answer the purpose, saturated with India-rubber, or other adhesive materials, to prevent wear. In other cases, a plummet of metal or glass, of the shape represented at A, fig. 3, may be used; if so, about half the length of line only is necessary.

A smaller line is recommended for sea practice, of about a quarter of an inch in diameter, and 200 feet long, having a number of conical or egg-shaped plummets of metal, glass, or ivory, upon it, at the extreme end from the ship, as represented at B, fig. 3. about three feet apart. Twelve of these, with a line of this length, at the speed of ten knots per hour, indicate six pounds avoirdupoise upon the pound and ounce scale of the instrument; or nine knots upon the scale of knots by the mercury. The pound and ounce scale is intended as a ready way of adjusting the instrument at all times, by proving it with such weights attached on shore.

By this means, the proper length of tow-line is readily ascertained for regulating the column of mercury to the scale and rate of sailing, by measured miles, of any vessel.

In what manner the connection between the towing-drag or plummets and the instrument is effected, depends upon where it is preferred to station and suspend the instrument, and from what part of the vessel to use the drags.

If it be hung in the cabin, as represented at D, fig. 1, (this being very convenient, on another account hereafter described, for shewing the trim of the vessel,) the plummets or drag should be worked from the stern; and, in order that the point of suspension of the cord or line 12, be as near the surface of the water as possible, a hole is bored through the stern, in a slanting direction downwards, as near the middle of the vessel as may be, but avoiding the rudder; and, to prevent the line rubbing against the sides of this hole, two pullies *f, f*, are inserted in the wood-work of the stern outside, one above and one below, to take off the friction from the cord.

It will be evident that this instrument, as well as the next described, is equally applicable for measuring the velocities of currents themselves, from vessels or boats, moored in rivers, rapids, raceways of mills, from bridges, or even from boats at sea;—where a heavy body is lowered to a great depth as a mooring, the strength and direction of a surface current may be easily ascertained.

At E, fig. 1, is shewn the manner in which this instrument is made to shew the trim of a vessel, the perpendicularity being always maintained by its manner of suspension. Immediately under it is placed a strong table *g, g*, having upon its surface a metal plate *h*, being horizontally secured when the vessel is in perfect trim, as to stem and stern, as well as crosswise, or otherwise, the best determined position for sailing. This plate has a centre point *i*, which is placed precisely under the index point, upon the instrument D, and which is as near the plate as possible without touching it. The plate is divided into lines, running at right angles with each other, one half longitudinally with the vessel, and the other at right angles thereto. These lines or divisions are calculated to form degrees of a circle, (the length of the instrument, from its point of suspension

k, to the index point *l*, being the radius,) consequently shewing at all times the degrees of inclination (if any) which the vessel has acquired from the perpendicular, or previously best determined sailing position.

Figs. 4 and 5, represent another form of instrument, likewise for this purpose, which is more conveniently used upon deck than the before-mentioned, as it may be placed upon the taffrail, or even in the binnacle, by passing a bell-wire under the deck to the stern, and attaching to this wire, at the stern, the same tow-line and plummets, or the egg-shaped ivory balls, (which are preferred,) about 12 in number, placed three feet apart upon the end of the tow-line;—these balls have a hole through them, longitudinally, which allows of their being strung upon the line, and a knot being tied in the line, behind each of them, secures them all in their proper places; the smaller or pointed end being forward upon the line, prevents any accumulation of sea weed, or obstruction of any kind, attaching itself.

Figs. 4 and 5, shew the instrument, with the cover removed. Fig. 4, is a side view, and fig. 5, a front view;—in both figures the same letters refer to similar parts. A, is the frame or bed of the instrument; B, is a barrel or arbor, with its pivots supported in the raised parts of the frame 1, and 2; upon this barrel, the inner end of the tow-line 3, is wound a turn or two, and secured to it; 4, and 5, are weights, fastened to the barrel B, which occasion the necessary resistance, as they are more or less lifted by the partial revolution of the barrel B, when the tow-line 3, is pulled, by being dragged through the water; 6, and 7, are other smaller weights, with the arms 8, and 9, for carrying the scale or card D, upon which are marked the miles per hour, or knots. It must be observed, that these arms and weights are suspended upon the same axle as the barrel B,

although loose and independent of it; the pivots of which pass through them within the raised parts of the frame 1, and 2.

The index wire or point *o*, is firmly fixed in the barrel B, and passes over and across the card or scale D. It will now be seen, that when the instrument is placed horizontally, or nearly so, in the stern of a vessel, whether in motion or not, that the card or scale will always find its true position by gravity, as steadily as the compass card by polarity; and that, as the barrel B, with the weights attached to its under side, is more or less acted upon by the resistance of the water, and the tow-line *s*, so will the index *o*, point out upon the scale (when properly adjusted) the number of knots, or rate, at which the vessel is sailing.

The patentee states,—I claim, in the first-described apparatus, the general arrangement, and especially the reversed open-mouthed tube, as well as the double water cistern; and in the second and last, the general arrangement of the instruments, together with the tow plummet, conical or otherwise; or a number of towing plummets; a flexible rope, saturated with India-rubber or other adhesive material; a close flexible chain; or, in fact, the towing of any body after, or from, a vessel for obtaining a resistance (not rotary) for operating upon the herein-described instruments, or any other weighing instrument which might be used herewith, on board of vessels, for ascertaining their velocities; or, by the same means, in fixed positions, for ascertaining the velocities of currents, whether they be in water or other fluids.—[*Inrolled in the Rolls Chapel Office*, 1841.]

To Richard Hornsby, *of Spittlegate, in the county of Lincoln, agricultural machine-maker, for an improved machine for drilling land, and sowing grain and seeds of different descriptions, either with or without bone, or other manure.*—[Sealed 25th November, 1839.]

This invention consists in the adaptation, to a drilling machine, of what the patentee terms "a seed and manure depositing wheel," placed in the drill, as shewn in the drawing, Plate XVI.,—which represents a section of a drill, containing the seed and manure depositing wheel.

The wheel or drum *a, a, a,* has its interior equally divided by six angular projecting pieces *b, b, b, b, b, b*; and in its periphery there are six doors *c, c, c,* which are capable of opening outwards on hinges, but are kept closed, until they arrive at a particular part of the drill, by the springs *e, e, e,* which press against the semi-circular shield *f.* The seed and manure are supplied by the funnels *g, g,* which discharge into the drum at the opening *h,* just below its axis, as shewn by the dotted lines.

When the machine is drawn forward, the drum is caused to revolve in the direction of the arrow; and each of the springs *e,* on passing the end of the semi-circular shield *f,* allows its door *c,* to open, (as shewn by dots,) and deposit the seed and manure contained in that division of the drum. Each of the divisions of the wheel receive their proper quantity of seed and manure, as they pass under the opening *h,* through which the materials enter from the hopper, and deposit the seed and manure, which they contain, in regular succession.

The patentee claims the seed and manure depositing wheel, with its appendages, whether the said wheel and its appendages are constructed of the form represented in the

drawing, or of any other variety of form, not essentially different from the same, and producing substantially the same results. He also claims a right to use the improved machine, either for depositing the seed and manure conjointly by one and the same operation; or for depositing the seed only, or manure only.—[*Inrolled in the Inrolment Office, May,* 1839.]

To WILLIAM ARMSTRONG, *of Hawnes, near Ampthill, in the county of Bedford, farmer, for his improvements in harrows.*—[Sealed 30th May, 1839.]

THE first part of these improvements consists in constructing harrows with bars of a zig-zag form, as shewn in the drawing, (see Plate XV.,) in place of the straight bars, in which the teeth or tines are usually fixed, by which means the teeth or tines are more advantageously applied, than when they are affixed to a straight bar, one behind the other.

The second part of these improvements relates to a mode of connecting the harrow to the draught-beam *a*, in order to keep it more steady to its work, and consists in attaching an additional hook *b*, in each side of the centre one *c*; where more play is required, the additional hooks can be disengaged.

The third part relates to the application of braces *d, d,* for connecting the draught-beam with the horses or other animals; or, in place of the braces, the guide *e, e,* (shewn by dotted lines,) may be used.—[*Inrolled in the Inrolment Office, November,* 1839.]

To James Wilmot Newberry, *of Hook-Norton, in the county of Oxford, farmer, and* George Saunders, *of the same place, clerk, for their improvements in machinery for dibbling or setting wheat and other grain or seed.*—[Sealed 2nd December, 1839.]

This invention consists, first, in an improvement in dibbles, which are arranged around the circumference of a revolving wheel. The dibbles are hollow, as shewn in fig. 1, Plate XVI., which represents a front view of the wheel, partly in section. These dibbles are adapted to receive wheat, or other grain or seed, within their hollows, the seed being introduced (by the means commonly used in drilling machinery) through a central hollow in the nave or centre chamber *a*, of the dibbling wheel; from which central hollow all the several dibbles *b*, radiate, and are supplied with seed.

The outermost ends of the dibbles, which project beyond the circumference of the wheel, are blunt-pointed, and qualified to penetrate into the ground, without exposing any opening at which the seed, contained within them, could drop out, until after the penetration has been effected; and then, whilst the hollow dibble is in the act of withdrawing from the hole which it has made in the ground, it opens a suitable passage for the wheat to pass out at for the purpose of its being left behind in the ground.

The opening of the end of the dibble may be effected by making each dibble in two halves, as shewn in fig. 2, one half being fixed to the dibbling wheel, and the other half moveable, or adapted to slide off from the centre of the wheel, so as to open the end, in order to let out the seed. The moveable half *d*, has a small stud or roller *c*, attached to it, which travels in a groove, on a circular plate attached

to the framing; the groove being so formed with indentations as to cause the moveable half, at the required time, to recede from the centre of the wheel, and, having deposited the seed, gradually to regain its former position.

Or the opening of the dibble may be effected by making the extreme end of each dibble in the form of a plug, to fit into and stop the end of the hollow tube of the dibble, and form a blunt-pointed end thereto; which plug, by sliding out from the centre of the dibbling wheel, will open a passage for the seed to drop out at the end of the tube around the plug.

The opening of the ends of the dibbles may likewise be effected, by causing each dibble to turn round, after it has penetrated into the earth, so that an aperture, at one side of the pointed end of the dibble, may be exposed, or turned away from a shield which covered it, in order to let out the seed.

Secondly,—This invention consists in placing several dibbling wheels, side by side, in one machine, each wheel turning in a framing of its own, hinged at one end, and at the other end supported by chains; thus each wheel is urged into the ground by its own weight, and is, at the same time, capable of rising or falling, independently of the others.—[*Inrolled in the Inrolment Office, June,* 1840.]

To Pierre Dufaure de Montmirail, *formerly of London Wall, in the city of London, but now of Panton-square, Haymarket, gent., for an invention of certain improvements in the manufacture of bread.*—[Sealed 2nd June, 1840.]

This invention consists, first, in an improved liquid for moistening the flour, in order to make the dough; secondly,

in an improved mode of adding salt to the flour; and thirdly, in an improved apparatus for making the dough.

First,—The liquid with which the flour is moistened, instead of using pure water, as in the usual way, is made as follows:—To eight quarts of boiling water four ounces of gum arabic is added; when the gum is completely dissolved, the liquor is run off into a vessel to cool, to about blood-heat, when it is fit to use, instead of pure water; and in the same manner in order to make the dough.

Secondly,—Instead of adding whatever salt is to be put into bread, as is usual, by mixing it with the water to be used to wet the dough, the quantity of salt required is highly dried before the fire, or in an oven, taking care not to burn it; and then pulverized as fine as possible, and in that state mixed thoroughly with the dry flour which is to be made into dough, and before it is wetted at all; this adds to the absorbent property of the flour, and causes the new liquid to mix more intimately with it.

The apparatus employed for carrying these improvements into effect, is shewn in Plate XV. A, is a closed boiler for heating and preparing the moistening liquid; B, is the cooler into which it is to be run when sufficiently heated, and the gum entirely dissolved; and C, is the kneading trough.

The patentee states, that bread made with this fluid, in the ordinary manner, and baked carefully, will yield a greater weight from the same quantity of flour, than when made on the old plan; and will be lighter, more wholesome, and more nutritious.

He claims, as his invention, the following improvements; that is to say, first, the use of the liquid or mixture, hereinbefore described, instead of water only, to wet up the dough; secondly, the mixing of the salt, in a very dry and minutely pulverized state, with the dry flour, and not with

the dough, or the water usually used to wet up or make the dough, as heretofore; and thirdly, the apparatus described. —[*Inrolled in the Rolls Chapel Office, December*, 1840.

To JOHN GORDON CAMPBELL, *of the city of Glasgow, in the county of Lanark, merchant, and* JOHN GIBSON, *of the same city and county, throwster, for their invention of a new or improved process or manufacture of silk; and silk, in combination with certain other substances.* —[Sealed 19th November, 1836.]

THE subjects of which this invention is said to consist, are stated under eight heads; firstly,—discharging the gummy matter from waste silk, when it has been brought into the states called sliver, or rove; secondly,—dyeing the silk when in those states; thirdly,—spinning the dross or heckle waste silk, of long fibre; fourthly,—mixing the same with flax of equal fibre; fifthly,—mixing the same with wool; sixthly,—spinning this kind of silk in a throstle frame; seventhly,—certain improvements in the throstle frame; and eighthly,—applying of water to the waste silk for the purpose of spinning it with a long ratch.

In proceeding to explain the details of these several heads of the invention, the patentees commence by describing the old process of treating waste silk, in order, we presume, that their improvements may appear by comparison; but to us they are by no means obvious.

Under the improved process, the waste silk is to be prepared by heckling machinery, in the same manner as flax is usually treated and brought into the state of roving. After this it is passed through systems of drawing rollers,

to undergo the ordinary drawing process, by which the fibres are drawn out and the roving elongated, which may then be wound into hanks.

Several hanks of roved silk, thus prepared, are to be tied up in bags and boiled with an alkaline solution, for the purpose of discharging the gum; and after being washed clean and dried, are to be reeled or wound upon bobbins.

In this state the prepared silk is to be placed in the drawing and doubling machines, where the fibres are further elongated, and the threads or yarns doubled; the pressing rollers being partially immersed in water, which will communicate moisture to the fibres at the bite, and produce adhesion, as they are doubled and twisted.

The dyeing process may be performed after the gum has been removed from the silk, either in the form of sliver or roving, or in the doubled state, tied up in a hank;—the preparation having rendered it more susceptible of receiving the dye. And the advantages of dyeing in this preparatory stage of the silk is, that the fibres will not be broken, as in the ordinary operation of dyeing; and, therefore, the surface of the silk, when finished, will be more glossy than if dyed afterwards.

When this prepared roving of silk is mixed with flax or wool, it may be spun in any of the old constructions of throstle machinery. But those preferred by the patentees are their improved throstles, in which the points of the spindles are placed nearer to the bite of the front drawing rollers than usual.

In these improved throstles, beside placing the points of the spindles nearer to the drawing rollers than usual, there are to be brass bosses on the drawing rollers. These we take to be brass pressing rollers on the top of the drawing

rollers; as the patentees say they are to prevent the stains which are sometimes produced by the wet material coming in contact with the iron rollers.

Owing to the closeness of the spindle points to the bite of the rollers, the yarns or threads will not be so subject to vibrate; and finer numbers of yarn may be thinly spun with facility. Another advantage is, that the silk thus produced from waste, will have a much more smooth and wiry appearance than has heretofore been obtained from spun waste silk, and will more nearly resemble Tram or Organzine.

Such is the description of the invention given by the patentees, and from which it does not appear, very clearly, that there is any invention or novelty whatever. The summing up states, that they disclaim any thing which has been known before, and claim only the subjects described under the eight heads first set forth.—[*Inrolled in the Inrolment Office, May,* 1837.]

To HARRISON BLAIR, *of Kearsley, in the county of Lancaster, manufacturing chemist, and* HENRY HOUGH WATSON, *of Little Bolton, in the county of Lancaster, chemist, for certain improvements in the manufacture of sulphuric acid, crystallized soda, and soda ash, and the recovery of a residuum or residuums applicable to various useful purposes.*—[Sealed 6th April, 1840.]

THESE improvements in the manufacture of sulphuric acid, crystallized soda, and soda ash, consist,—

Firstly,—In the application of the refuse lime which has been employed in the purification of coal gas; such refuse lime, impregnated with sulphur, being a material hitherto

of very little value. From this refuse lime the sulphur is to be separated by combustion, and, consequently, sulphurous acid gas will be by that means obtained, which is thus to be converted into sulphuric acid, either by the ordinary means, or by the new process explained in a subsequent part of this specification.

After the refuse lime has been exposed a few days to the action of a dry atmosphere, in order to dissipate the small quantity of ammonia contained in it, the combustion of the sulphur is effected by placing the lime upon the bed or floor of a furnace or oven, arranged for the purpose; which bed or floor is heated, (but not to a high temperature,) and a stream of atmospheric air, (hot air is proposed,) or oxygen gas, directed over and upon the surface of the lime; which surface may be changed or renewed by the operator, with a rake or other utensil, as often as required, and till he finds the combustion discontinues.

The patentees prefer, that instead of the heat being applied under the bed of the furnace, it should be thrown from the top, which may be done by placing an iron plate or tile roof a foot or more above the bed of the furnace, and allowing the flame from the fire, confined by an arched flue, to pass over the said roof. By these means, a sufficient heat will be afforded, by radiation from the plate or tile, to ignite and burn off the sulphur. Instead of the plate or tile, a brick or iron arch may be used.

The purified calcareous residuum, from which the sulphur has been burnt, may then be removed from the furnace or oven, and replaced by a fresh portion of the refuse lime from coal gas works; and so on successively.

The sulphurous acid gas, produced by the combustion of the sulphur, is allowed to pass, as from ordinary sulphur furnaces, into a leaden chamber or other receptacle, wherein it is to be converted into sulphuric acid.

The refuse removed from the furnace or oven, (after the combustion of the sulphur,) and to which the patentees apply the term "calcareous residuum," consisting principally of carbonate of lime, may be applied to many of the purposes to which calcareous earths are commonly applicable, and is very suitable to be used instead of lime-stone, or ordinary calcined lime, along with carbonaceous matter in the decomposition of sulphate of soda, (frequently called "salt cake,") during the process of the manufacture of soda; whether that variety sold under the name of "soda ash," or crystallized carbonate of soda, commonly called "crystallized soda." To this purpose the patentees apply this product in the same manner, and in about the same proportion as lime-stone is generally applied.

The claim, as respects this part of the invention, is the application of the refuse lime from coal gas works; that is to say,—lime, after it has been used in the purification of coal gas from sulphur, sulphuretted hydrogen, or other compound of sulphur, to the manufacture of sulphuric acid; and also of soda, whether "soda ash," or crystals of soda, when the same is manufactured through the medium of the decomposition of sulphate of soda, by carbonaceous matter. But the patentees do not confine themselves to any precise plan or method of using the said refuse lime, further than that to obtain sulphuric acid from the same, they cause the sulphur to undergo combustion, without having previously expelled it by the application of an acid; nor do they limit themselves to the separation of the sulphur from the said refuse lime, previously to applying it to the manufacture of soda, as it may be used for this purpose as soon as, and in the state in which it is received from the coal gas works; though they prefer previously separating, by combustion, the sulphur from it, and thereby rendering it doubly useful.

Secondly,—When sulphuric acid is produced, by burning sulphur from pyrites, in the usual manner, it is frequently contaminated with oxide of arsenic in solution, which is detrimental to the use of sulphuric acid in many of the processes to which it has to be applied. It also frequently happens, that sulphuric acid, produced in the usual manner, whether by the combustion of ordinary rough sulphur or brimstone, or that obtained from pyrites, is contaminated, in a more or less degree, with one or more of the combinations of oxygen with nitrogen; in consequence of which, it is less economically applied by dyers, in forming a solution of indigo, than it otherwise would be.

It is, therefore, one part of this invention to prevent the concentrated or rectified sulphuric acid produced, from being contaminated by the injurious ingredients mentioned; this is effected in the following manner:—

The weak acid being drawn off from the chamber or other vessels, either immediately or after it has been in part concentrated by evaporation, a stream of sulphuretted hydrogen gas is caused to bubble through it; by which, if oxide of arsenic be present, a yellow precipitate of sulphuret of arsenic, sometimes called orpiment or King's yellow, is formed; and if the compound or compounds of oxygen and nitrogen, alluded to, be present, they are to be decomposed,—sulphurous acid or sulphuric acid being generated in their stead. The operator must, therefore, continue causing the sulphuretted hydrogen to bubble through the acid, till it does not appear to produce any chemical change, and till the acid, after having been cleared by filtering or otherwise, has no bleaching action upon sulphate of indigo when boiled therewith.

When the sulphuretted hydrogen has produced the required change, the sulphuric acid is separated by filtering or decanting from any sulphuret of arsenic which may have

been formed, and then put into the retorts or stills for final concentration or rectification; and the sulphuret of arsenic is well washed with water, in the manner in which chemists usually wash precipitates, and then dried; after which, it is fit for use for the several purposes to which King's yellow is generally applied.

In this part of the invention, the patentees do not claim the use of sulphuretted hydrogen for precipitating arsenic from solution in general, nor do they claim the manufacture of King's yellow by this operation; but they do claim the application of sulphuretted hydrogen, as an agent in preparing for concentration or rectification, such sulphuric acid as would otherwise be in an unfit state for undergoing that final part of the process of its manufacture; not confining themselves to the precise mode, which has been mentioned, of applying the sulphuretted hydrogen,—for instead of it being caused to bubble through the liquid, the liquid may be agitated in an atmosphere of the said gas, which will give the desired effect. It is, therefore, considered, that the adoption of any direct means of bringing sulphuretted hydrogen into intimate contact with sulphuric acid, before it has undergone concentration or rectification, would be an infringement of their invention.

Sulphuretted hydrogen, for this purpose, may be produced by acting upon the waste or refuse lime (containing sulphuret of calcium) from the manufacture of soda, and also upon the lime which has been used in the purification of coal gas, by muriatic or other acid; though the sulphuretted hydrogen, thus produced, be mixed with carbonic acid, it will answer the purpose well. It must, however, the patentees observe, be understood, that no claim is laid to these means of producing sulphuretted hydrogen for our purpose. We prefer producing our sulphuretted hydrogen by one of the following methods:—

First method.—We cause aqueous vapour (steam) to pass over iron pyrites, or any refuse iron pyrites, kept red-hot in a vessel, into the interior of which, atmospheric air is not allowed to enter during the operation; which vessel may be of cast-iron, similar to the retorts in which coal gas is generated; the outlet should be at the further end of the retort, so as to cause the steam to come into contact with a great extent of red-hot surface; or, instead of an iron vessel, an oven or furnace, formed of bricks, which can be kept at a red heat by a fire outside, may be used.

When sulphuretted hydrogen is produced by these means, it is accompanied, at the commencement of the operation, by sulphurous acid gas, and by some uncombined sulphur; and, therefore, it is advantageous to allow the gases to traverse a long trough or passage, kept cool, in which the uncombined sulphur deposits; and thence to let the gases enter a sulphuric acid chamber, furnace, or oven, until, by testing it with a salt of lead, sulphuretted hydrogen is found to constitute a large portion of the gas under preparation; then turn its course and cause it to bubble through, or be brought into contact with the sulphuric acid, to be prepared for concentration or rectification; and the residuary gas, unabsorbed by the sulphuric acid, is allowed to enter a chamber or furnace.

It is observed by the patentees, that what they mean by "refuse iron pyrites," is the pyrites which has been used in the manufacture of sulphuric acid, and has discharged the principal portion of its sulphur. It is this partly decomposed pyrites which they call "refuse iron pyrites."

Instead of passing aqueous vapour over the iron pyrites, as before mentioned, we cause hydrogen gas to pass over and among the pyrites, whilst kept red-hot. By another method, the patentees mix iron pyrites, in fine powder, with lime, reduced to powder, and water; or with lime, in

combination with carbonic acid. Chalk will do, or the refuse lime from coal gas works, either before or after the sulphur has been separated from it. The mixture is to be made into a paste, and then rendered red-hot, in a close vessel; when the mixture has been thoroughly heated, for about half an hour, it is then withdrawn and allowed to cool; and it may be slaked with water to prevent the oxidation of the sulphur. The quantity of lime, or carbonate of lime, which is to be mixed in this operation, with a given quantity of pyrites, will depend upon the quantity of sulphur which the pyrites contain. If, by analysis, it be found to contain thirty-two per cent. of sulphur, then mix with every one hundred parts, by weight, fifty-six of lime, or one hundred of carbonate of lime. In using the refuse pyrites, it is advised that there should be mixed with it about one-fourth of its weight of coal; which, in the subsequent application of a red heat, tends to decompose the oxide of iron which it contains.

The calcined mixture, when cooled, is to be put into a still or other suitable vessel, and a quantity of muriatic or diluted sulphuric or nitric acid, or acetic acid, poured upon it, when sulphuretted hydrogen gas will be copiously disengaged. This is to be conducted to the sulphuric acid, intended to be prepared for concentration or rectification.

In producing sulphuretted hydrogen, by the last-mentioned method, we obtain or recover two valuable residuums,—one, a solution of the protoxide of iron, by the acid employed, and which is useful for many purposes in the arts, being a sulphurous residuum left undissolved by the acid. In this part of the invention, the patentees claim the application of heated iron pyrites, or refuse iron pyrites, in the manner mentioned, with aqueous vapour, or hydrogen gas, in the production of sulphuretted hydrogen, to be used in the manufacture of sulphuric acid; not con-

fining themselves to any particular form or arrangement of apparatus, to be used for obtaining the same. They also claim the application of the calcined compound, formed from lime and iron pyrites, with acid, in the production of sulphuretted hydrogen, when it is to be used in the manufacture of sulphuric acid, without confining themselves to any particular apparatus respecting the same, or to the exact proportions mentioned; and whether the same may have been made into a paste with water before being calcined or otherwise.

Thirdly,—This part of the invention consists in applying, by combustion, the sulphur contained in hydro-sulphuret of lime (or the compound formed by sulphuretted hydrogen being brought into contact with hydrate of lime) to the manufacture of sulphuric acid, and in applying the "calcareous residuum," produced by the abstraction of the said sulphur, to the decomposition of sulphate of soda, in the manufacture of soda ash, or crystals of soda. The means proposed are as follow:—

Sulphuretted hydrogen, whether pure or mixed with other gases, should be caused to pass through a pipe to a vessel containing hydrate of lime, similar to those vessels used in purifying coal gas by the "dry lime purification," should the sulphuretted hydrogen be admitted. The hydrate of lime, having a chemical affinity for the sulphuretted hydrogen, will arrest it in its passage, and form the compound required; and any gas or gases which might have been mixed with the sulphuretted hydrogen, and which are not absorbable by hydrate of lime, will pass through and escape from the vessel. It will be known when the hydrate of lime is sufficiently impregnated with sulphuretted hydrogen by that gas being detected passing through the lime, and off from the vessel, without being absorbed.

It is well to use several vessels connected together. The

hydrosulphuret of lime having been produced, it is to be used in the manufacture of sulphuric acid, in the same manner as the refuse lime from coal gas.

Having burnt off the sulphur constituent of the hydrosulphuret of lime, the calcareous residuum or refuse is to be used instead of lime-stone, or ordinary lime, with carbonaceous matter in the decomposition of the sulphate of soda, in the manufacture of soda; as we use that calcareous residuum, resulting from our operation of burning the sulphur from the refuse lime from coal gas works, in the manner explained in the preceding part of this specification.

It must be understood, that in this part of the specification, the patentees do not claim, as their invention, the manufacture of hydro-sulphuret of lime, nor the use of any particular arrangement of apparatus, nor of any ingredients in the formation of it; but that they do claim the using, by combustion, in the manufacture of sulphuric acid, the sulphur contained in hydrosulphuret of lime, or in the compound formed by the absorption of sulphuretted hydrogen by hydrate of lime; and that they also claim, in the manufacture of soda, the use of the calcareous residuum left, after as much sulphur has been burnt off from the said compound as it is practicable to burn off.

Fourthly,—The next part of the invention consists in applying a residuum, obtained by combustion, to the manufacture of sulphuric acid. When sulphuretted hydrogen gas is produced by muriatic acid, (hydro-chloric acid,) carbonic acid or other acid being caused to act upon the waste or residuum (in a moist state) resulting from the manufacture of soda; and to form which, lime has been one of the constituents of the mixture used in effecting the decomposition of the sulphate of soda;—a quantity of sulphur is deposited in or among that portion of the ingredients which the acid agent does not dissolve. This undis-

solved residuum is submitted to the action of heat, either in a furnace or oven, allowing the admission of atmospheric air; by which the sulphur undergoes combustion, and the sulphurous acid gas produced is allowed to pass into the chamber or receptacle, wherein its further conversion, into sulphuric acid, is to proceed.

In this part of the specification, the formation of sulphuretted hydrogen, by the means mentioned, is not claimed, nor the use of that gas, nor the production of soda, nor any salt of soda; but claim is made to the application, by combustion, of the insoluble residuum, produced by the means mentioned in the manufacture of sulphuric acid.

Fifthly,—This part of the invention consists in causing the several gases or vapourous mixture, commonly used in the manufacture of sulphuric acid, to act more speedily in effecting the change from sulphurous to sulphuric acid, than what has hitherto been general in the manufacture of sulphuric acid. In the ordinary process, adopted for the manufacture of sulphuric acid, sulphurous acid gas, nitric or nitrous acid vapour, (produced by heating a mixture of nitrate of potash, or nitrate of soda, and sulphuric acid,) with nitrogen and atmospheric air, with some aqueous vapour, are allowed to mingle in a leaden chamber, and to pass through that into one or more other chambers, necessarily, until the operator thinks fit to allow the gaseous or vaporous residuum to pass away and diffuse itself into the atmosphere.

The patentees avoid this loss, and more speedily produce the acid desired; thus,—as soon as the several gases have had time to be intimately diffused among each other, they expose the mixture to a red heat, by causing it to pass through a pipe, heated red hot; which pipe may be filled with siliceous stones or other articles not materially acted upon by the heat or the acid, whereby they get an in-

creased amount of red-hot surface. The pipe may be of platinum, or earthenware, or even of cast-iron; or a flue of brick-work, kept heated; the consequence of which is, that sulphuric acid is immediately formed, and passes away from the heated apparatus in the state of vapour, or having a fog-like appearance. This newly-formed sulphuric acid is then to be condensed into a liquid state, by allowing aqueous vapour to mix with it as it passes away from the heated apparatus. The mixture is then made to pass through a leaden worm refrigerator; the dilute acid thus formed, is then collected into a boiler or still of lead, or other suitable material, which must be kept heated, so as to concentrate the acid and expel the aqueous vapour.

The vapour or fog-like body of acid, may be caused to pass up through a long leaden or other suitable pipe, placed vertically, and filled with siliceous pebbles, which may be kept wet, whereby the liquid will absorb the vapour or fog-like body of acid, and acquire increased strength. The same acid liquor may be caused repeatedly to pass through the pipes or other channels, until it has acquired a considerable degree of concentration, or until the operator thinks it prudent to remove it for full and final concentration, in the usual manner, by evaporation.

In this part of the specification, the patentees do not claim any particular arrangement of apparatus, nor the use of any particular materials of which the apparatus may be formed, nor the use of any of the ingredients whereby or whereof the acid is formed, nor any particular means of condensing the acid when formed,—but that which they do claim, is, submitting or exposing to a red heat, or to a temperature nearly approaching redness, the mixture of the several ingredients, and which are in frequent use in the manufacture of sulphuric acid in the ordinary manner. It must also be distinctly observed, that they do not limit

their claim to the high temperature, when the said gaseous or vaporous mixture has been confined to one chamber or receptacle only, but that it also extends to the application of the high temperature, to what is by some called the "waste gases," to the gaseous or vaporous residuum, which, after having traversed through more chambers than one, on the ordinary plan of making sulphurous acid; because, by its application to such residuum, they obtain a quantity of sulphuric acid, which would otherwise have been lost; and at the same time prevent that usual residuum which has hitherto been deleterious to animal and vegetable life, from passing into the atmosphere.—[*Inrolled in the Petty Bag Office, October,* 1840.]

Original Communication.

APPLICATION OF CHEMICAL SCIENCE TO COMMERCIAL TRANSACTIONS.

By Andrew Ure, M.D. F.R.S., Professor of Chemistry.

REPORT OF A CHEMICAL EXAMINATION OF TWENTY-FOUR PIECES OF CORAHS, FROM CALCUTTA, MANY OF WHICH WERE MORE OR LESS DAMAGED BY MILDEW.

These pieces of silk were put into my hands, for analysis, on the 18th of February, after I had, on the preceding 12th of the month, visited the St. Katharine's Dock Warehouses, in New Street, Bishopsgate Street, for the purpose of inspecting a large package of the Corahs, per Colonist. I was convinced, by this inspection, that, notwithstanding the apparent pains bestowed upon the tin plate and teak wood packing cases, certain fissures existed in them, through which the atmospheric air had found access, and had caused iron-mould spots upon the gunny wrapper, from the rusting or oxidizement of the tinned iron.

I commenced my course of analysis upon some of the pieces which were most damaged, as I thought they were most likely to lead me to an exact appreciation of the cause of the mischief; and I pursued the following general train of research:—

1. The piece of silk, measuring from 6 to 7 yards, was freely exposed to the air, then weighed, afterwards dried near a fire, and weighed again, in order to determine its hygrometric property, or its quality of becoming damp by absorbing atmospheric vapour. Many of the pieces absorbed, in this way, from one-tenth to one-eighth of their whole weight; that is, from one ounce to one ounce and a half upon 13 ounces. This fact is very instructive, and shows that the goods had been dressed in the loom, or imbued subsequently with some very deliquescent pasty matter.

2. I next subjected the piece to the action of distilled water, at a boiling temperature, till the whole glutinous matter was extracted; five pints of water were employed for this purpose, the fifth being used in rinsing out the residuum. The liquid wrung out from the silk was evaporated first over the fire, and towards the end over a steam bath, till it became a dry extract; which, in the damaged pieces, was black, like extract of liquorice, but in the sound pieces was brown. In all cases, the extract so obtained, absorbed moisture with great avidity. The extract was weighed in its driest state, and the weight noted, which shewed the addition made, by the dressing, to the weight of the silk. The piece of silk was occasionally weighed in its cleansed state, when dry, as a check upon the preceding experiment.

3. The dry extract was now subjected to a regular chemical analysis, which was modified according to circumstances, as follows:—100 parts of it were carefully ignited in a platinum capsule; during which a considerable flame and fetid smoke were disengaged. The ashes or incombustible residuum were examined by the action of distilled water, filtration, as also by that of acids, and other chemical tests, whereby the constituents of these ashes were ascertained. In the course of the incineration or calcination of the extract from the several samples, I never

observed any sparkling or scintillation; whence I observed that no nitre had been used in the dressing of the goods, as some persons suggested.

4. Having, in the course of boiling, some of the extract from two of the damaged pieces, in a little distilled water, felt a urinous odour, I was induced to institute the following minute course of researches, in order to discover whether the urine of man had been introduced into the dressing paste of the silk webs. I digested a certain portion of the said extract in alcohol, 60 per cent. over proof, which is incapable of dissolving the rice water, or other starchy matter, which might be properly applied to the silk in the loom. The alcohol, however, especially when aided by a moderate heat, readily dissolves urea, a substance of a peculiar nature, which is the characteristic constituent of human urine. The alcohol took a yellow tint, and, being after subsidence of the sediment, decanted clear off into a glass retort, and exposed to the gentle heat of a water bath, it distilled over clear into the receiver, and left a residuum in the retort, which possessed the properties of urea. This substance was solid when cold, but melted at a heat of 220° Fahr.; and at a heat of about 245° it decomposed with the production of water and carbonate of ammonia,—the well-known products of urea at that temperature. The exhalation of the ammonia was very sensible to the smell, and was made peculiarly manifest by its browning yellow turmeric paper, exposed in a moist state to the fumes, as they issued from the orifice of the glass tube, in which the decomposition was usually effected. I thus obtained perfect evidence that urine had been employed in India in preparing the paste with which a great many of the pieces had been dressed. It is known to every experienced chemist, that one of the most fermentative or putrefactive compositions which can be made, results from the mixture of human urine with starchy or gummy matter, such as rice water; a substance which, by the test of iodine water, these Corahs also contained, as I shewed to the gentlemen present, at my visit to the Bonding Warehouse.

5. On incinerating the extract of the Corahs, I obtained, in

the residuum, a notable quantity of free alkali; which, by the test of chloride of platinum, proved to be potassa. But, as the extract itself was neutral to the tests of litmus and turmeric paper, I was consequently led to infer, that the said extract contained some vegetable acid, probably produced by the fermentation of the weaver's dressing, in the hot climate of Hindostan. I, accordingly, examined the nature of this acid, by distilling a portion of the extract along with some very dilute sulphuric acid, and obtained, in the receiver, a notable quantity of the volatilized acid condensed. This acid might be the acetic (vinegar,) the result of fermentation, or it might be the formic or acid of ants, the result of the action of sulphuric acid upon starchy matter. To decide this point, I saturated the said distilled acid with magnesia, and obtained on evaporation, the characteristic gummy mass of acetate of magnesia, soluble in alcohol, but none of the crystals of formiate of magnesia, insoluble in alcohol. From the quantity of alkali (potassa) which I obtained from the incineration of the extract of one piece of the damaged silk, and which amounted to six grains at least, I was convinced that wood-ashes had been added, in India, to the mixture of sour rice water and urine, which would therefore constitute a compound remarkably hygrometric, and well qualified to keep the warp of the web damp, even in that arid atmosphere, during the time that the Tanty or weaver was working upon it. The acetate of potassa, present in the said Corahs, is one of the most deliquescent salts known to the chemist; and, when mixed with fermented urine, forms a most active hygrometric dressing,—one, likewise, which will generate mildew upon woven goods, with the aid of heat and the smallest portion of atmospheric oxygen. By the above-mentioned fermentative action, the carbon, which is one of the chemical constituents of the rice or starchy matter, had been eliminated, so as to occasion the dark stains upon the silk, and the blackness of the extract taken out of it by distilled water.

6. That the dressing applied to the webs is not simply a decoction of rice, becomes very manifest, by comparing the incinerated residuum of rice with the incinerated residuum of the extract of

the said Corahs. I find that 100 grains of rice, incinerated in a platinum capsule, leave only about one-fifth of a part, or 1 in 500 of incombustible matter, which is chiefly siliceous sand; whereas, when 100 grains of an average extract of several of these Corahs were similarly incinerated, they left fully 17 parts of incombustible matter. This consisted chiefly of alumina or earth of clay, with silica, potassa, and a little common or culinary salt. (Has the clay been added, as is done in Manchester, to give apparent substance to the thin silk web?)

From the above elaborate course of experiments, which occupied me almost constantly during a period of four weeks, I was fully warranted to conclude that the damage of the said goods had been occasioned by the vile dressing which had been put into them in India; which as I have said, under the influence of heat and air, had caused them to become more or less mildewed, in proportion to their original dampness when packed at Calcutta, or to the accidental ingress of atmosphere of air into the cases during the voyage from Calcutta to London.

The following is the list of Corahs which I chemically examined:—

1 and 2, per Colonist, from Calcutta, 2 pieces, sound.—These two pieces had been dressed with a sweet viscid matter, like jaggery or goor, (molassy sugar,) mixed with the rice water. This extract contained no urine, but emitted a smell of caramel or burned sugar, when ignited. It amounted to 270 grains in the one, and 370 in the other.

3, ditto, 1 piece, mildewed, 1st degree. This piece had been dressed like No. 5, and contained no trace of urine. It afforded 400 grains of a most deliquescent sweetish glutinous matter.

4, ditto, 1 piece, mildewed, 1st degree, as No. 3.

5, ditto, 1 piece, mildewed, 3rd degree. This piece contained no trace of urine, but it afforded 210 grains of a light brown extract, being rice water, mixed with something like jaggery.

6, ditto, 1 piece, 3rd degree, mildewed. This piece afforded

evidence of urine in it, by test of carbonate of ammonia. The extract amounted to 320 grains.

8, ditto, 2 pieces, damaged in the 3rd degree. The total weight of one of these pieces, after exposure to air, was 4610 grains, and it lost 440 grains by drying. The total weight of the other was 4950 grains, and lost 320 grains by drying. The weight of extract was, in one piece, 210 grains; and both pieces contained abundant traces of urine, as well as of potash. These constituents, along with the rice water, accounted sufficiently for the great damage of these two pieces by mildew.

10, ditto, 2 pieces, sound. These contained no urea. Each afforded from 300 to 500 grains, of a light brown vegetable extract.

12, ditto, 2 pieces. The extract in the, one amounted to 222 grains, and in the other, to 330. Both contained urea, and had, therefore, been imbued with urine.

14, ditto, 2 pieces, mildewed, 3rd degree. There was no urea in the extracts from these two pieces; but they afforded, the one 300 grains of extract, and the other 750. But this extract was a saccharine molassy matter, impossible to dry over a steam heat. The same quantity as the last, if dried by stronger means, would have weighed probably 600 grains. Its extraordinary deliquescence kept the pieces very moist, and thereby caused the mildewing of them. With the saccharine matter, four per cent. of culinary salt was mixed in one of these extracts.

16, ditto, 2 pieces, 3rd degree of mildew. The extract, about 200 grains, contained abundant evidence of urea, and consequently, urine.

18, ditto, 2 pieces, sound. Both these contained some traces of urea; but the one yielded only 102 grains of extract, and the other 370 grains. They must have been well screened from the air to have resisted the action of the urine.

20, ditto, 2 pieces, damaged, 1st degree. No urea. The extract of the one was 320 grains; of the other piece 380; and it had a light brown colour, being a saccharine mucilage.

22, ditto, 2 pieces, 3rd degree, mildew. 200 grains of extract in the one, and 210 in the other; they contained urea.

24, 2 pieces, 3rd degree of mildew. 310 grains of extract in the one, and 180 grains in the other. Both were impregnated with urea, and consequently with urine.

Having in the preceding report demonstrated, by the clearest processes of chemical research, that the above mildewed Corahs had been damaged by the fermentative decomposition of the dressing paste with which they had been so abundantly impregnated, I would recommend the importers of such goods to cause the whole of the dressing to be washed out of them, and the pieces to be thoroughly dried before being packed up. I believe that clean silk may be kept and transported, even in the most humid atmosphere, without undergoing any change, if it be not imbued with fermentative paste.

REPORT OF A CHEMICAL EXAMINATION OF EIGHT PIECES OF CORAHS, SEVERAL OF WHICH ARE MORE OR LESS DAMAGED BY MILDEW.—BY ANDREW URE, M.D. F.R.S., &c.

1st piece, per Colonist, sound. This piece had been impregnated with rice water, mixed with a molassy mucilaginous matter, of the nature of jaggery and goor. The extract taken out of it by boiling distilled water, weighed, when dried by a steam heat, 280 grains.

2nd piece, sound. Afforded 450 grains of a similar saccharo-mucilaginous extract, being about one-tenth the weight of the whole piece.

3rd piece, mildewed, 1st degree. This afforded no less than 500 grains of the same extract; to the fermentation of which, the mildew is to be ascribed.

4th piece. This afforded 520 grains of the same kind of extract, which was no doubt the cause of its being mildewed in the first degree.

5th piece, mildewed, 3rd degree. This afforded 400 grains of the above kind of extract; and having been more exposed

to air, or damper at its packing in Calcutta, became more mildewed.

6th piece, mildewed, 3rd degree. It afforded 360 grains of deliquescent sweet extract, to which fermentation the damage is due.

7th piece, and 8th piece, yielded extracts of the same character. That from the second weighed no less than 625 grains, and was exceedingly deliquescent. It consisted of rice water, mixed with sweetish matter, like molasses. It contained also some acetate of potash, (possibly from the addition of wood-ashes to the fermented sour rice water,) as also some common salt. Such a deliquescent paste as this could not fail to keep the silk moist, and to promote fermentative decomposition upon its surface.

London.—13, *Charlotte Street,*
Bedford Square.—*May*, 1841.

Scientific Notices.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from page 342, Vol. XVIII.)

Feb. 9, 1841.

The PRESIDENT in the Chair.

"Upon the Application and Use of Auxiliary Steam Power, for the purpose of shortening the time occupied by Sailing Ships, upon distant voyages." By Samuel Seaward, M. Inst. C. E.

But few years have elapsed since the possibility of propelling vessels by the power of steam was treated as a chimera; and although the practibility of its application for short voyages has been successfully demonstrated, by the numerous vessels plying

between this country and the Continent, it is but of very recent date that its employment for long sea voyages has been adopted. The weight of the powerful machinery and the fuel, and the consequent loss of space for cargo, together with many other circumstances attendant on the present construction of steam vessels, induced the author (who received the education of a seaman, and has since had extensive practice as an engineer) to believe that a more efficient mode of employing steam power, for long sea voyages, might be adopted.

Notwithstanding the great improvements which have taken place in the construction of steam vessels, and their machinery, it would appear that the duration of the voyage ought not to exceed twenty days, after which time a fresh supply of fuel becomes necessary; hence, steam has rarely been adopted for very long voyages. The reason of this limit to the duration of the voyage of a steam vessel, as at present equipped, is that an increase of power does not produce a corresponding increase of speed, while the weight of machinery increases in proportion to the power employed, and in some cases exceeds it; for instance, small engines, with the water in the boilers, generally weigh about one ton per horse power, while in some large engines the ratio is nearly twenty-five cwt. per horse power.

A quadruple increase of power will not produce double the original velocity in a steam ship, although, in theory, such is assumed to be the case; for, as the weight is more than double, the immersed sectional area becomes greater, and a still further increase of power is necessary. It has been shown by experience, that if a vessel, with a given power, is propelled through the water at the rate of eight miles per hour, her speed cannot be doubled, even though the power be multiplied twelve times, and the entire hold of the vessel be occupied as an engine room.

The weight of fuel is also in direct proportion to the size of the engines; so that taking for example, two vessels of two hundred and of four hundred horses power respectively—that of the higher power will have to carry nearly double the weight, both of fuel and of engines, and it is still questionable whether the increased

force will propel the one ship more than $1\frac{1}{2}$ mile per hour faster than the other.

The space occupied by the engines and fuel, in the most valuable part of the ship, is also an important consideration: neither the "President" nor "British Queen" steamer, although of two thousand tons measurement, is capable of carrying more than five hundred tons of cargo, when the fuel is on board.

The author then examines the question of employing too much power in a steam vessel, and refers to the "Liverpool," as an instance that such may be the fact. It appears that with the original dimensions of thirty feet ten inches beam, and engine power of four hundred and fifty horses, being a proportion of power to tonnage of about 1 to $2\frac{1}{4}$, the vessel was immersed four feet beyond the calculated water line, and a decided failure was the natural consequence; but when the breadth of beam was increased to thirty-seven feet, augmenting the capacity of four hundred tons, and giving the proportion of one horse power to $3\frac{3}{4}$ tons burthen, the performance of the engine and the speed of the vessel were both materially improved.

The "Gem," Gravesend steamer, one hundred and forty-five feet long, by nineteen feet beam, had two engines of fifty horses power each; the speed was insufficient, being only twelve and a half miles through the water; but when the same engines were placed in the "Ruby," which was one hundred and fifty feet long, and nineteen feet nine inches beam, the velocity of the latter vessel was thirteen and a half miles per hour. A pair of engines, of forty-five horses power each, were then placed in the "Gem," without altering the vessel, and in consequence of the diminished weight and draught of water, her speed then nearly equalled that of the "Ruby."

The author does not condemn the application of considerable power for vessels, providing it can be employed without materially increasing the weight and the area of the immersed midship section. It appears that the length of a steam voyage, to be profitable, is at present limited to twenty days for the largest

class of steamers; that we have about thirty others which can approach twelve days, while the majority cannot employ steam beyond eight days successively, without a fresh supply of fuel. It is evident, therefore, that more efficient means must be adopted for the general wants of commerce in our extended intercourse with the East and West Indies, the Pacific, Mexico, Brazil, Australia, and all the distant colonies, which now demand rapid communication with England.

The author refers to a pamphlet, published by him in 1827, entitled "Observations on the possibility of successfully employing Steam Power in Navigating Ships between this country and East Indies by the Cape of Good Hope." He therein proposed that large square-rigged ships, of fifteen hundred to eighteen hundred tons measurement, should be fully equipped and constructed, so as to sail ten or eleven miles per hour with a fair wind; that they should carry engines of small power, to assist the sails in light winds,—propel them at a moderate speed during calms,—work into and out of harbour, &c.,—and thus shorten those portions of the voyages wherein so much time was usually lost.

To all well-built good-sailing vessels, of four hundred tons and upwards, "auxiliary steam" is applicable. A steam-engine of the necessary power, can, without inconvenience, be placed in such vessels, either on or between decks, so as to propel a ship at the rate of four to five nautical miles per hour in a calm, and for this speed a proportion of one horse power to twenty-five tons is amply sufficient. The practicability of applying this system to East Indiamen and other similar vessels, is then examined at length, and it is shewn that the ordinary speed of these ships under sail, is, before the wind, eleven to twelve miles per hour, and in a gale thirteen to fourteen miles per hour, which is greater by two or three miles per hour than that of any ordinary steam vessel when uuder sail, on account of the latter being impeded by the wheels trailing in the water, and the slightness of their masts, spars, and rigging. The auxiliary steam power might, therefore, be efficiently applied, either by using it alone, or in

conjunction with the sails, so as to keep up a uniform speed, by which a great saving of time could be effected in a long voyage.

The conditions of sailing and steaming voyages to India, with the influence of the trade-winds, are then examined, and the author proceeds to detail the experiments made by him, on board the "Vernon" Indiaman, which was the first sailing vessel that actually made a voyage out and home with "auxiliary steam."

The "Vernon," built in 1839, by the owner, Mr. Green, was one thousand tons burthen; the sailing speed was about twelve to thirteen miles per hour in a fresh gale, and being from her frigate build well calculated for the experiment, it was determined to equip her with a condensing engine of thirty horses power, placed midships on the main deck, between the fore and main hatchways; the space occupied being twenty-four feet long by ten wide. The weight of the machinery was twenty-five tons, and it was so arranged that the motion was communicated direct from the piston cross-head, by two side rods, to the crank on the paddle shaft, placed immediately behind the lower end of the steam cylinder, which was horizontal. The wheels were fourteen feet diameter, projecting five feet, and were so constructed that the float boards could be raised to suit the draught of water of the ship; or they could be taken entirely away, if necessary, leaving the shafts projecting only eighteen inches beyond the sides. Under ordinary circumstances they were disconnected from the engine by a simple contrivance, consisting of a moveable head, attached to the crank on the paddle shaft, by turning which, one quarter of a circle, the crank pin was liberated, and the wheels turned freely round. The "Vernon," thus equipped, having on board nine hundred tons of cargo, and sixty tons of coal, drew seventeen feet of water. In the first trial the speed of the vessel, under steam alone, was five and three-quarters nautical miles per hour, demonstrating how small a power is necessary for a moderate speed. She then started for Calcutta, and though the piston rod broke three times during the voyage, owing to a defect in one of the paddle shaft bearings, the passage was satisfactory. The details are given min utely, as are also those of the homeward voyage, which was perfo med from Calcutta to

London in eighty-eight days, to which must be added seven days for necessary delay at the Cape, making a total of ninety-five days, which is the shortest passage on record. Great credit is given to Captain Denny for the judgment with which he used the auxiliary steam power, and the course taken by him, by which he was enabled to overcome the difficulties incidental to a first trial of so important a system. The success of the " Vernon," induced the immediate application of engine power to the " Earl Hardwicke" Indiaman, and both these vessels are now on their voyage out to Calcutta.

This communication was accompanied by drawings of the "Vernon" and the "Earl Hardwicke," and by a chart, on which was laid down the proposed daily course of a steam ship, on a voyage to and from Calcutta, showing where sails only were necessary, then where steam alone, and also when the joint agency of steam and wind would be required. Also the daily progress of the "Marquis of Huntly" Indiaman, of fourteen hundred tons burthen, on a voyage to India and China, and home, from the author's own observation, in the year 1816.

For the purpose of demonstrating the ratio of power to velocity, a Table was also given showing the velocities of ships of different tonnage, having steam power of various ratios, deduced from upwards of one hundred experiments on large steam vessels. The mode of disengaging the cranks was illustrated by models showing the gradation, from the complication of the first idea, to the beautiful simplicity of the present plan, which is now employed on board of the Government war steamers.

Mr. S. Seaward explained the Table of velocities of steam ships, which accompanied his paper.

The top line of figures represents the number of horses power, ranging from thirty to three hundred. The side line gives the tonnage of the steam ships, rising progressively from one hundred to twelve hundred tons. The intermediate spaces show the num-

ber of knots or nautical miles, which a ship of given tonnage, with a certain power, will travel through still water per hour.

The tonnage is calculated by the old rule (13 George III. cap. 74): "From the length subtract 3-fifths of the breadth, multiply that sum by the extreme breadth in the widest part, and again by half the breadth, divide the product by 94, and the quotient will be the true tonnage."

The Table is constructed upon the principle, that each vessel of a good modern form will carry, at a proper draught, a weight equal to her measurement tonnage, and is presumed to be loaded equal to her tonnage, either by the weight of her engines, fuel, or cargo, and it terminates at thirteen knots, at which speed the engines alone become the full load of the ship. The mode of constructing and of using the table was fully described, and examples were given.

It was shown, that an engine of thirty horses power would propel a ship of twelve hundred tons burthen, at the rate of 4 knots per hour, while three hundred horses power would only propel the same ship at the rate of $10\frac{4}{9}$ knots per hour. Hence, ten times the power would only produce about two and a half times the speed.

The principal points in the paper were more fully dwelt upon, and, in answer to questions from some of the members, Mr. Seaward remarked, that no steamer in England had ever been propelled at more than fifteen geographical miles per hour, through still water.

In some of the Government mail packets, the engines and coals were the full cargo of the vessel. The table did not apply to vessels overladen with power, for as the weight increased in the ratio of the power, so the immersed sectional area was augmented, and the lines of the vessel, which might be well calculated for speed when at a proper draught, became lines of retardation, and the engines did not work up to their proper speed, owing to the depth to which the paddle floats were immersed. For instance:—The wheels of the "British Queen" have been plunged between six and seven feet, instead of four feet, which was the calculated dip; the engines at

the same time diminishing their speed so much as to reduce the effective power from five hundred horses to nearly three hundred horses.

The only advantageous way in which great power could be applied, would be by contriving to prevent the increase in the weight of the machinery and fuel, and those engineers would be most successful who could so apply the materials of construction, as to ensure strength without the usual corresponding increase of weight.

Mr. George Mills, from his experience as a ship-builder, at Glasgow, was enabled to confirm all that Mr. Seaward had advanced. On the Clyde, the employment of an excess of power in steam vessels had been carried to the greatest exent, without producing corresponding advantages, either for speed, or in a commercial point of view. It would appear that the same error had, to a certain degree, been committed on the Thames, but less than on the Clyde; for on the latter river there were vessels with nearly double the power, in proportion to the size, as compared with any vessel on the former river. He believed that on the Thames no vessels had so much as one horse power for each register ton, whereas on the Clyde, there were steamers of seventy to eighty tons register, having single engines, with cylinders of fifty-four inches diameter, which was more than one hundred horses power. It would appear that this application of extra power had only obtained a very moderate speed, while the great first outlay, with the commensurate current expenses, had reduced the commercial profit to the lowest point,—of this the proprietors alone could give any account; but as to the speed attained, he had seen three steamers of identical tonnage leave the Broomielaw at the same time, their engines being respectively of one hundred and ten, eighty, and sixty horses power; yet their speed was in the inverse ratio of their power: the vessel with the smallest engine arrived at Greenock first, the greater power second, and the greatest last. These remarks were only applicable to river boats. With regard to sea-going vessels, the system had not been carried to so serious an extent, yet with

them the average proportion was about one horse power to two register tons, and some few reached as high as one horse to one and one-eighth of a ton.

As an example of an augmentation of power producing an opposite result from that which was intended, Mr. Mills mentioned two vessels called the "Tartar" and the "Rover," built by him and his (then) partner, Mr. Charles Wood. They were each of about two hundred and twenty tons register, built from the same draught, and in every respect as similar as possible—except that the engines, which were by the same maker, were respectively of one hundred and seventy, and one hundred and thirty horses power; yet whenever they worked together, the one with the smaller power proved herself the faster vessel, either in a calm, with the wind, or even against it. The "Achilles," Liverpool steamer, which lately had an addition of thirty feet to her length, and eighteen inches to her breadth, augmenting the tonnage about one-fifth, had improved her speed upwards of one mile per hour, although she carried a much heavier cargo than before.

He had built a vessel of five hundred and sixty tons register, with engines of one hundred and thirty horses power on board—a proportion of power to tonnage of one to four; the stowage for cargo was ample; the accommodation for passengers excellent. She drew little water, and her speed was much greater than vessels of double her power. Yet in spite of all this, the vessel could not find a purchaser, because the power was not nominally large.

It would be asked—why, with these and so many similar instances, such a system was continued? It was not likely that the engineers would complain of having orders for large engines; and there were certain dimensions prescribed for the vessel, to which the ship-builder was under the necessity of conforming.

The chief cause of mischief, however, was the fiat of the public. It was believed that a great power would remedy want of speed and all other evils, and it was found indispensable for ensuring the confidence of travellers. Hence, the shipowners, who depend upon the public for support, were obliged, against the

conviction of their experience, to keep up the errors occasioned by ignorance.

The President observed, that the condemnation of large power should not be carried too far, as experience alone had produced the increase of weight, strength, and power, of the present engines, compared with those of the early steamers which were built, instancing the Halifax Packets (Cunard's), which with their great power in proportion to tonnage, had performed their duties satisfactorily.

Mr. Mills explained that the Halifax Packets were built for the especial purpose of carrying the mails only, to perform the voyage in a given time,—about twelve days. The engines were built by Mr. Robert Napier, after the model of those of the "Great Western," which used their steam expansively; similar provisions had been made in the Halifax Packets, but the expansion valves were seldom used.

Mr. Field agreed with the principal part of Mr. Seaward's paper, but he would prevent an erroneous conception of the term *overpowering* a steamer. A vessel could not have too much power, provided that power could be advantageously applied, without causing too deep an immersion. A good result could be produced only by keeping a proper proportion between the machinery, the vessel, and the paddle wheels, and immersing the hull of the steamer only as deep as the true lines of draught.

Mr. Vignoles observed, that in this country the reputation of engineers depended upon the commercial success of the works they engaged in. An erroneous public opinion might have influence present; but if the engineer and ship-builder would determine to break these trammels, and produce such vessels as should force conviction upon the public mind by the speed attained, and show the proprietors the consequent commercial advantage, the present system would soon be abandoned.

Mr. Parkes eulogized Mr. Seaward's candour in describing the errors in the first construction of the engine on board the Vernon; more was frequently to be learned from failures than from successful efforts, and no communications to the Institution

would be so useful as those which gave accounts of defective design or construction, with the details of the methods adopted for remedying the defects. He directed attention to the performances of the "Great Western" steam ship, which at least equalled those of the Halifax Packets, without the disadvantages of being unable to carry cargo, or of shipping so much sea, when the weather was foul. The important feature of economy of fuel on board the "Great Western" might be in part attributed to the use of steam expansively. It was very desirable that the Institution should possess very full drawings and a description of the "Great Western," so as to be enabled to compare them with those of the Halifax Packets, which had been promised by Mr. George Mills. He would impress upon manufacturers of marine engines the necessity of adopting a correct and uniform nomenclature of the power placed on board steam vessels. The nominal selling power did not accord with any calculation.

Mr. Field believed the Table of Velocities calculated by Mr. Seaward to be very nearly accurate. The speed of the "Great Western," when loaded to her proper draught, had been as high as $13\frac{8}{10}$th miles through still water. There was an error in the alleged speed of Cunard's vessels; they reached Halifax in ten days, Boston in three more, and then had still one day's voyage to New York. The average duration of the voyages of the "Great Western," was about fourteen days and a half. If two hundred tons were deducted from the tonnage of the "Great Western" for cargo and the accommodation for the passengers, she would then be similar to the Halifax Packets. The engines of the "Great Western" were nominally estimated at four hundred horses power, and the average consumption of fuel was twenty-six tons every twenty-four hours.

During the discussion, Mr. Cubitt had calculated the following Table, showing the rates of velocity which would be attained by substituting engine power, with its consequent weight of one ton per horse power, for cargo, so as to preserve the draught of water the same in all cases.

TABLE showing the power required to obtain various rates of speed in a steam vessel, where the total weight of cargo and engines remains in all cases the same, and in which, with a power of 30 horses, a speed of 5 miles per hour is obtained; and the total weight carried being in all cases 1000 tons, and the engines weighing 1 ton per horse power.

Weight of Cargo.	Weight and Power in Tons and Horse Power.	Relative Speed.	Speed in Miles per hour.
970	30	$5\sqrt[3]{1}$	5.
940	60	$5\sqrt[3]{2}$	6.299
910	90	$5\sqrt[3]{3}$	7.211
880	120	$5\sqrt[3]{4}$	7.937
850	150	$5\sqrt[3]{5}$	8.549
820	180	$5\sqrt[3]{6}$	9.085
790	210	$5\sqrt[3]{7}$	9.564
760	240	$5\sqrt[3]{8}$	10.
730	270	$5\sqrt[3]{9}$	10.4
700	300	$5\sqrt[3]{10}$	10.772
670	330	$5\sqrt[3]{11}$	11.119
640	360	$5\sqrt[3]{12}$	11.487
610	390	$5\sqrt[3]{13}$	11.756
580	420	$5\sqrt[3]{14}$	12.050
550	450	$5\sqrt[3]{15}$	12.331
520	480	$5\sqrt[3]{16}$	12.599
490	510	$5\sqrt[3]{17}$	12.856
460	540	$5\sqrt[3]{18}$	13.103
430	570	$5\sqrt[3]{19}$	13.34
400	600	$5\sqrt[3]{20}$	13.572
370	630	$5\sqrt[3]{21}$	13.794
340	660	$5\sqrt[3]{22}$	14.01
310	690	$5\sqrt[3]{23}$	14.219
280	720	$5\sqrt[3]{24}$	14.422
250	750	$5\sqrt[3]{25}$	14.62
220	780	$5\sqrt[3]{26}$	14.812
190	810	$5\sqrt[3]{27}$	15.
160	840	$5\sqrt[3]{28}$	15.182
130	870	$5\sqrt[3]{29}$	15.3615
100	900	$5\sqrt[3]{30}$	15.535
70	930	$5\sqrt[3]{31}$	15.706
40	960	$5\sqrt[3]{32}$	15.854
10	990	$5\sqrt[3]{33}$	16.037

Mr. Seaward remarked, that his Table of power and velocities was corroborated by Mr. Cubitt's—the practical results verified both. The great difference between the "Great Western" and the Halifax Packets, consisted in the better adaptation of weight and power to tonnage, and the more economical consumption of

of fuel of the former over the latter—the one carrying cargo and passengers, the other only the engines and fuel, yet the "Great Western" travelled farther with the same quantity of fuel.

In answer to a question relative to American steam boats, he believed that the build of the river steamers was very peculiar: some of them had engines of six hundred horses power on board, yet they drew only four feet of water, whereas a sea-going steamer with that power would draw at least sixteen feet. As far as he could ascertain, the actual well-authenticated speed did not exceed fourteen and a half geographical miles per hour through still water. The fuel consumed could not be ascertained, as it was chiefly wood, taken on board at the places of stoppage; there was a great consumption of steam at a very high pressure. Their machinery was not heavy and was specially adapted to the vessels. Daily improvements were making in the form of vessels in England, and when high pressure steam and light engines were applied to vessels of a different form from those at present constructed, the speed must be increased. Some vessels were now building on the Thames of an extremely light construction, with tubular boilers, and the weight of the machinery would be only eleven cwt. per horse power.

Scientific Adjudication.

In our last, we reported the trial of an action at law, in the Jury Court, at Edinburgh, (Brown *v.* Annandale,) for the alleged infringement of a patent, granted in Scotland, 4th of February, 1836, for improvements in machinery or apparatus for making paper. The invention, under consideration, was also the subject of a patent, granted in England to the inventor, James Brown, of Esk Mills, in the parish of Penicuik, North Britain,—for the specification of which, see Vol. X., page 40, of the present Series of our Journal.

The important feature of the invention, is a box, with an open top. From this box, the air is to be exhausted, whilst the wire web, on which the fluid paper pulp is spread, passes over it for the purpose of causing the pressure of air above, to force the water from the pulp through the wire web into the exhausted box below, and thereby leave the new-formed sheet of paper in a nearly dry state.

The patentee acknowledged, in his specification, that an exhausted box, having a lid or cover, with perforations for the discharge of the water, had been used before; but his invention was an open box; and, considering that paper of large size might be required to be made in the machine, and that the opening in the top of the box might thereby be increased, so as to render necessary some further support to the wire web, beside the mere edges of the box,—observed, towards the close of his specification, "that proper arrangements may be made to support the wire web, if thought necessary."

The defendant adapted to his machine a box, like that described by the plaintiff, but placed bars across the top of it, which he argued constituted a lid or cover, and therefore, his box was not an open one, as claimed by the plaintiff, and hence no infringement; insisting further, that the words of the specification, "proper arrangements may be made to support the wire web, if thought necessary," were vague, and not explanatory as to whether such support were necessary or not, and how those supports were to be made.

Much discussion took place, as to whether these bars constituted a lid or not. Other arguments were also raised, respecting a cylindrical vacuum box, used by Fourdrinier, and a vacuum apparatus, used by Evans, neither of which appear to have effected the question.

The counsel for the defendant then stated, that it was his intention to bring evidence to prove that the invention, specified by the plaintiff, had been publicly used in England before the date of the Scotch patent.

The counsel for the plaintiff objected to the admission of any

such evidence, on the ground that the previous use of the invention in England was not a ground for invalidating the plaintiff's patent in Scotland. The counsel for the defendant did, however, insist that such evidence was competent and admissible, and ought to be received, as proving a ground of invalidity of the patent.

At this stage of the proceedings, Lord Mackenzie adjourned the Court until the following day.

The Court met again, according to adjournment, and his Lordship repelled the objection of the plaintiff's counsel, and found, that the said evidence was admissible, as proving a ground of the invalidity of the patent. On which the counsel for the plaintiff excepted to the opinion of his Lordship, and tendered the exception accordingly, in the form of the following minute:—"In respect of the opinion of the Judge, that the use and practice averred, as to England, is competent in evidence to establish the first use for the defendants, the plaintiff admits that the verdict must, in point of fact, go on that first issue for the defendants, subject to exception to the opinion of the Judge: the plaintiff admitting, that if the above point of law is decided against him, the defendants are entitled to judgment in the cause."

15*th May*, 1841. (*Signed*) JOHN HOPE.

An appeal to the whole bench of Judges will be taken upon this question; and if the judgment be there confirmed, it is presumed that a further appeal will be brought before the House of Lords.

We understand that it is the opinion of all the Crown Lawyers in Scotland, and we believe in England also, that, in a patent right, Scotland is a *foreign country*, in respect of England and Ireland, just as much so as Hanover; which, till recently, belonged to the same Crown,—and on that understanding we have always proceeded; the principle being, that a *prior* usage of an invention in *Scotland*, did not invalidate the English patent right, and *vice versa*.

The precedent which directed this extraordinary opinion of

the Judge, was found in an *old decision* of the Scotch Courts, not much known, and passed at a time when very few patents were granted in Scotland. This decision was discovered by the defendant's counsel, and will probably still rule the case when it comes before the whole bench. The Judges, however much they may doubt the expediency of the decision, may consider that they are tied down by it. The most probable chance of a reversal will be by the English Chancellor; and it may be twelve months or more before it will be brought to a final decision.

The opinion of Sir Frederick Pollock has, we are informed, been taken upon this question, and his decided view of the case is, that Scotland and England are foreign countries to each other in respect of patent rights for inventions.

We have no hesitation in stating, as our conviction, that the antiquated decision brought forward in this case, must be overruled, unless ONE PATENT be made to extend over the WHOLE EMPIRE.

Since England, Scotland, and Ireland, have become one United Kingdom, it appears absurd to grant three distinct patents for the several countries; and, as a rule prevails in Scotland of allowing only four months, from the date of the grant, for the inrolment of the specification, whilst six months are allowed in England,—it is, in most cases, absolutely necessary to defer the application for a Scotch patent until some months after the English patent has been granted; consequently, in all such cases, (supposing the above antiquated precedent to be the acknowledged law,) most of the patents granted in Scotland, would be invalid, from the invention having been previously known in England by the grant of the patent here, on a prior date.

COURT OF COMMON PLEAS, AT WESTMINSTER.

June, 1841.

Before Chief Justice Sir N. Tindal and a Special Jury.

Gibson and another *v.* Brand.

This was an action for the alleged infringement of a patent right, granted to the plaintiffs, 19th November, 1836, (for specification of which see our present Vol., page 387,) in which Sir F. Pollock, Mr. Sergeant Bompas, Mr. M. H. Hill, Mr. Hoggins, and Mr. Gale, appeared for the plaintiffs; and Sir W. Follett, Mr. Kelly, Mr. Sergeant Channell, and Mr. Henderson, for the defendant.

The trial of the cause commenced on Saturday, and was continued on Monday and Tuesday, until eight o'clock in the evening, when the Jury retired to consider their verdict.

The substantial questions at issue may be stated in a very few words. The plaintiffs, Messrs. Gibson and Campbell, obtained a patent in 1836, "for a new and improved process of manufacturing silk, and silk in combination with other fibrous substances." The feature of improvement appeared to be, that of spinning silk, in the long fibre, from waste silk; for which purpose they employed the old flax-spinning machinery, with certain alleged improvements, consisting chiefly in the use of brass bosses or rollers, in the old throstle frame; and in reducing the distance between the drawing rollers and the top points of the spindles; also in immersing the pressing rollers partially in water,—the water being thereby brought to act upon the silk at the bite of the rollers, just where the drawing ceased and the spinning began.

The length of the ratch, rack, or reach, which is the extension of the thread to be spun from the drawing rollers to the points of the spindles, was to be less than usual, perhaps from 11 to 15 inches.

The plaintiffs admitted that the several parts of the machine were not new, individually; but they laid claim to novelty in their combination and use; and witnesses were called on their behalf, who stated that they had never heard of the spinning of silk, in the long fibre, from waste silk, until the plaintiffs invented and obtained their patent.

On behalf of the defendant, a large number of witnesses, of great respectability, were examined, who deposed, that silk was spun in the long fibre, from silk waste, long before the date of the plaintiffs' patent; and that their machine was neither new in its parts nor in their combination.

Among other witnesses, Mr. Pattison stated that, as far back as the year 1816, the same kind of fabric as that manufactured by the plaintiffs, was produced at his mills, at Congleton, and was sold by him to different houses in Coventry, Nottingham, London, and other places. The silk, thus manufactured, was spun from the flax-spinning machine then in use, differing, as was stated, in no respect from the model of the plaintiffs' machine, except in the distance between the rollers and the spindles, which frequently varied even in ordinary throstle frames.

Other witnesses spoke to the use of brass bosses or rollers, in the throstle frame, many years ago; and the application of water at the "nip," was sworn to have been known for the last forty years, and to have been in constant use ever since.

The Chief Justice summed up the evidence, and the Jury retired, for two hours, to consider their verdict; and at 10 o'clock at night they returned into Court, and stated their opinion, that the *invention*, as described in the plaintiffs' specification, was not new, but that the *process* was improved,—amounting to a verdict for the defendant.

A PROPER AND LEGITIMATE SUBJECT FOR A PATENT.

The FRANKLIN JOURNAL, for May, has very elaborately discussed the question as to what is or is not a proper and legitimate subject for a patent.

It appears that John F. Kemper, Esq., of Cincinnati, applied to the Government Office, at Washington, for a grant of Letters Patent, in the United States, for his invention of *an improvement in the manner of stowing ice.* This improvement consisted merely in setting up the slabs of ice edgewise; as it was stated the petitioner had discovered that the ice would not melt so readily in that position as if laid flat, or thrown in a promiscuous heap.

The authorised functionaries, after an examination of the petition and specification, refused the grant, and delivered the following answer:—

Sir,—" The specification of your improved vessel for stowing and carrying ice, is herewith returned for amendment in the claim, which is deemed to be too broad; the mode of arranging the ice, by placing the blocks edgewise, cannot, in the judgment of this office, constitute a claim to a patent, as it is believed, that every one has a right to pack away ice, by placing the blocks edgewise, or in any other position. The mode of caulking does not present any thing substantially new, the same having long since been effected."

Yours, &c.,

H. L. ELLSWORTH.

This official report seems to have produced a very long correspondence between the law officers and the legal advisers of the petitioner; but the main feature of argument discussed, is,

whether *setting up the slabs of ice edgewise,* is such an invention as ought to be made the subject of a patent.

The solicitor for the petitioner says, " it appears to me that, in the case in hand, the office has entirely mistaken its powers and its duties, and has assumed an authority not intended to be given to it by the legislature." He then goes on to say, that under the laws of the United States, patents are granted for " any new and useful art, machine, manufacture, or composition of matter, or any new and useful improvement on any art, machine, manufacture, or composition of matter, not known or used by others before his or their discovery or invention."

The question then is this :—Is the packing of ice edgewise, a *new and useful art ?* or a new and useful *improvement* on any art ?

Philadelphia was once proverbially famous for its learned lawyers, and their tact in treating a knotty question ; that talent seems not to have extended itself to Washington.

Without determining what the wisdom of our Attorney-General or Solicitor-General might have resolved under these difficult circumstances, we feel perfectly satisfied, that after the grant of such a patent, and the inrolment of a most skilfully drawn specification of the invention, all the courts of law in the British Empire would have been unable to prevent any man from setting up his ice edgewise, if he thought proper so to do.

List of Patents

Granted by the French Government from the 1st of April to the 30th of June, 1840.

PATENTS FOR TEN YEARS,—CONTINUED.

Lassere, of Coudet-sur-Vezère, (Dordogne,) for a machine for making chains in metallic wire.

Hallette, of Arras, for a machine for excavating and dragging.

Grenetier, of Lyons, for a lithographic press.

Zimmer, of Paris, for a machine for spinning flax and hemp.

Gentilhomme, of Rambervillers, for improvements in flour mills.

Lasseron and Rollet, of Niort, for an apparatus for the preservation of corn.

Sprye, of Paris, for the calcination of sulphate of lime.

Havard, Uncle and Nephew, for a water-closet.

Bourdon, of Paris, for an apparatus for telling the level of water in steam generators.

Muel, of Paris, for Persian blinds, in iron, &c.

Marie, of Paris, for a new lamp.

Chibon, of Paris, for a new system of roofing houses.

Fauquet Lemaître, of Bolbec, for improved looms.

Manby, of London, for the means of making gas for illumination.

Randall, of Paris, for an improved knapsack.

Rambaud, of Lyons, for an improved powder for the clarifying of wines.

Pernet, of Paris, for improved trusses.

Lamotte, of Bruxelles, for a new pump.

Triger and Lascasses, of Paris, for an improved method of constructing shafts in mines.

Truffaut, of Paris, for an apparatus for preserving people from immersion.

Sudds, Adkins, and Barker, of Rouen, for a mechanical process for uniting bands or straps used in machinery.

Bleyer, of Mulhouse, for a method of decomposing the sulphate of lead.

Malmazet, Sen., Desplanque, Jun., and Co., of Lille, for looms for manufacturing brocaded tissues.

Caussin, of Berthenay, (Haute Marne,) for an improved machine for reaping corn.

Callas, of Paris, for powder to preserve worsted articles from moths

Jardin, of Belleville, for an apparatus for portative aromatic dry baths.

PATENTS FOR FIVE YEARS.

Vendroux, of Calais, represented in Paris by M. Perpigna, advocate of the French and Foreign Office for Patents, Rue Choiseul, No. 2, ter., for improvements in that kind of bobbin net frames, known under the name of *straight bolts.*

Lalande, represented in Paris by M. Perpigna, advocate, for new stores.

Vacheron and Lefrançois, represented in Paris by M. Perpigna, advocate, for tissues in caoutchouc, without seams.

Holtorp, of Paris, represented in Paris by M. Perpigna, advocate, for an improved lamp burner.

Marion, represented in Paris by M. Perpigna, advocate, for the manufacture of paper with prismatic rays.

Mathey, of Baume les Dames, represented in Paris by M. Perpigna, advocate, for locomotives without rails.

Gillet and Monier, represented in Paris by M. Perpigna, advocate, for impermeable fabrics.

Blondel, of Rouen, represented in Paris by M. Perpigna, advocate, for improvements in looms.

Benoist, of Neubourg, represented in Paris by M. Perpigna, advocate, for an apparatus by which the snuffing of candles is dispensed with.

Carteron, of Mâcon, represented in Paris by M. Perpigna, advocate, for an inexplosible steam generator.

Delonay, of Die, represented in Paris by M. Perpigna, advocate, for a weighing instrument.

Bouchet, Sen., of Nimes, represented in Paris by M. Perpigna, advocate, for improved steam-engines.

Papavoine and Chatel, of Rouen, represented in Paris by M. Perpigna, advocate, for the manufacturing of cards for wool and cotton.

Coffineau, of Paris, for an oven for baking plaster and lime.

De Bergue, of Paris, for an improved loom.

Whitehead, of Brompton, near London, for a new coffee pot.

Mangin and Tesfier, of Paris, for improvements in umbrellas.

Andelle and Soulas, of Paris, for the manufacturing of rockets for signals.

Bacle, of Paris, for a new kind of shoes.

Braithwaite, of New-road, London, for a new lanthorn.

Davey, of Camberwell, near London, for a diving apparatus.

Devienne, of Belleville, for an oven for baking onions.

Poirier de St. Charles, of Paris, for an improved instrument for finishing embroidery.

Galy, of the 7th Regiment of Artillery, at Metz, for an improved bit for bridles.

Jalade Lafond, of Paris, for improved trusses.

Bernhardt, of Paris, for improvements in pianos.

Mulot, of Paris, for a portable vapour bath.

Boucher, of Lavillette, near Paris, for manufacturing of beetroot sugar.

De Castro and De Salazar, of Paris, for an improved bellows.

Dervise, of Paris, for manufacturing of straps for suspenders.

Legras, of Paris, for a new busk for stays.

Mordan and Co., for an improved pen-holder.

Lejeune, of Paris, for improved hinges, for doors, &c.

Clachet, of Paris, for improved lamps.

De Rhoden, of Paris, for improvements in pianos.

Oudinot Lutel, of Paris, for a fabric, called *crino-gase.*

Lena, of Paris, for water for cleaning oil paint.

Jouet, of Stolberg, (Prussia,) for an oven for extending window glass.

Giraud, of Bourg, St. André, for a process for killing and drying the chrysalis of the silk worm.

Verité, of Beauvais, for new escapements for clocks.

Busnel, of Paris, for grease for carriages and machines, &c.

Boucher and Danvers, of Paris, for skeletons for silk hats, in twilled cotton tissue.

Clarac, of Bordeaux, for improvements in vinification.

Martoret, of Paris, for metallic collars with springs.

Demichelis and Monnier, of Paris, for an electro gaseous power, to be used as a substitute for steam.

Lepage de Rennes, for a machine for excavating canals.

Poussier, of Paris, for an apparatus for preventing the explosion of gas used for illumination.

Thuvien, of Paris, for a lithographic press.

Bastide Brothers and Landero, of Nimes, for a frame for manufacturing net for hammocks, game bags, &c.

Engelhardt, of Strasbourg, for a method for polishing and colouring marble globes

De Dalmas, of Alby, for a new press, with a piston.

Blondeau, of Paris, for an improved pantograph.

Tester, of Paris, for improvements in rail-roads.

Portefais, Ramondenc, and Sumat, of Lodève, for a machine for combing refuse wool.

Molinard, of Paris, for an improved batten for making velvet.

Lefrançois, of Ingouville, for an apparatus for clearing the entrance of harbours.

Dubain, of Paris, for an hydraulic lamp.

Harding, of Turcoing, for combs for combing wool.

Lefèvre, of Paris, for ornaments in plastic substances.

Lecœur, of Paris, for prepared plaster, for making letters in relief.

Pezieux, of Paris, for an improved ligneous paper, to be used for hangings.

Lefuel, of Paris, for a machine for the polishing of floors of apartments.

Lautoin, of Draguignan, for a new pump.

Gouet and Gaudin, of Lyons, for an improved Jacquard loom.

Depoilly Brothers, of Escarbotin, for a new lock.

Coeur, of Paris, for a new flute.

De Jongh and Son, of Lauterbach, for a machine for the winding of thread.

Promoli, of Boulogne, for a process for producing patterns upon wood, pasteboard, &c.

Sterlingue and Co., for a process for tanning.

Soins Contrejean and D'Autricourt, of Vazemmes, (Nord,) for an apparatus for extracting the colouring matter from dye-wood.

Prudon, of Paris, for solid ink.

Visa Koenig, of Paris, for a new opera glass.

Gérin, of Lyons, for an improved pump.

Gauthier Brothers, of Grenold, for stoves for burning wood and and coal

Cerbeland, of Paris, for a new generator of heat

Froger and Loysel, of Paris, for a new mode of publicity.

Fontaine, of Chartres, for a new *turbine* wheel.

Desaglire, of Valenciennes, for enamel applied to iron.

Packam, of Eu, for a machine for making planks.

Oulman, of Bordeaux, for hones and strops for sharpening razors.

Charollais, of Paris, for a new system of chimnies.

Chabrié, of Paris, for improvements in carcel lamps.

Chilliot, of Paris, for calico for book-binding and other purposes.

Plalavet, of Paris, for manufacturing velvet with refuse silk.

Mulot, of Petit-Andely, for a machine for drying thread.

Baudin, of Paris, for an improved grinding-stone for pulverising mustard seed.

Perreymond, of Marseilles, for a chest proof against fire.

List of Patents

That have passed the Great Seal of IRELAND, from the 18th May to the 18th of June, 1841, inclusive.

To Hugh Lee Pattinson, of Grove, near Gateshead, in the county of Durham, manufacturing chemist, for his improvements in the manufacture of white lead.—Sealed 25th May.

John Rand, of Howland-street, in the county of Middlesex, gentleman, for improvements in preserving paints and other fluids.—Sealed 25th May.

Nathan Defries, of Paddington-street, in the county of Middlesex, engineer, for improvemonts in gas meters.—Sealed 2nd June.

List of Patents

Granted for SCOTLAND, subsequent to May 22nd, 1841.

To Edward Henshall, of Huddersfield, in the county of York, carpet manufacturer and merchant, for certain improvements in making, manufacturing, or producing carpets and hearth rugs.—Sealed 24th May.

William Petrie, of Croydon, in the county of Surrey, gentleman, for a mode of obtaining a moving power, by means of voltaic electricity, applicable to engines, and other cases where a moving power is required.—Sealed 24th May.

Moses Poole, of Lincoln's Inn, in the county of Middlesex, gentleman, for improvements in the manufacture of fabrics, by felting,—being a communication from abroad.—Sealed 24th May.

William Joest, of Ludgate Hill, in the city of London, merchant, for improvements in propelling vessels,—being a communication from abroad.— Sealed 24th May.

Andrew Mc Nab, of Paisley, in the county of Renfrew, North Britain, engineer, for certain improvements in the manufacture of bricks.—Sealed 26th May.

Christopher Nickels, of York-road, Lambeth, in the county of Surrey, gentleman, for improvements in mattrasses, cushions, paddings, or stuffings, and in carpets, rugs, and other napped fabrics,—being partly a communication from abroad, and partly an invention of his own.—Sealed 1st June.

John Clay, of Cottingham, in the county of York, gentlemen, and Frederick Rosenborg, of Sculcoats, in the county of York, gentleman, for improvements in arranging and setting up types for printing.—Sealed 3rd June.

Sir Samuel Brown, Knight of the Royal Hanoverian Guelphic Order, Commander in Her Majesty's Navy, of Netherbyres

House, Ayton, in the county of Berwick, for improvements in the means of drawing or moving carriages and other machines along inclined planes, railways, and other roads, and for drawing or propelling vessels in canals, rivers, and other navigable waters.—Sealed 4th June.

William Brockedon, of Queen-square, in the county of Middlesex, Esq., for a composition of known materials, forming a substitution for corks and bungs.—Sealed 9th June.

John Lambert, of No. 12, Coventry-street, in the Parish of St. James, within the liberty and city of Westminster, gentleman, for certain improvements in the manufacture of soap,—being a communication from abroad.—Sealed 10th June.

Richard Laming, of Gower-street, Bedford-square, in the county of Middlesex, Surgeon, for improvements in the production of carbonate of ammonia.—Sealed 14th June.

Joshua Field, of Lambeth, in the county of Surrey, engineer, for an improved mode of effecting the operation of connecting and disconnecting from steam-engines the paddle-wheels used for steam navigation.—Sealed 16th June.

Andrew Mc Nab, of Paisley, in the county of Renfrew, North Britain, engineer, for an improvement or improvements in the making or construction of meters, or apparatus for measuring water or other fluids.—Sealed 21st June.

Joseph Maudslay, of Lambeth, in the county of Surrey, engineer, for improvements in the arrangement and combination of certain parts of steam-engines to be used in steam-navigation.—Sealed 21st June.

John Condie, of Blair Iron-works, Ayr, in the Kingdom of Scotland, for improvements in applying springs to locomotive, railway, and other carriages.—Sealed 22nd June.

George Richards Elkington and Henry Elkington, of Birmingham, in the county of Warwick, for improvements in coating, covering, or plating certain metals.—Sealed 22nd June.

Moses Poole, of Lincoln's Inn, in the county of Middlesex, gent., for improvements in producing and applying heat,—being a communication.—Sealed 22nd June.

New Patents

SEALED IN ENGLAND.

1841.

To George Bent Ollivant, and Adam Howard, of Manchester, millwrights, for certain improvements in cylindrical printing machinery for printing calicoes and other fabrics, and in the apparatus connected therewith, which is also applicable to other useful purposes.—Sealed 5th June—6 months for inrolment.

John Mee, of Leicester, frame-smith, for improvements in the manufacture of looped fabrics.—Sealed 5th June—6 months for inrolment.

William Hannis Taylor, of Lambeth, Esq., for certain improvements in propelling machinery.—Sealed 5th June—6 months for inrolment.

Joseph Gibbs, of the Oval, Kennington, civil engineer, for certain improvements in roads and railways, and in the means of propelling carriages thereon.—Sealed 5th June—6 months for inrolment.

Miles Berry, of the Office for Patents, 66, Chancery-lane, patent agent, for certain improvements in machinery or apparatus for ruling paper,—being a communication.—Sealed 5th June—6 months for inrolment.

James Colley March, of Barnstaple, surgeon, for certain improved means of producing heat from the combustion of

certain kinds of fuel.—Sealed 8th June—6 months for inrolment.

Henry Richardson Fanshaw the younger, of Hatfield-street, Surrey, chemist, for improvements in curing hides and skins, and in tanning, washing, and cleaning hides, skins, and other matters.—Sealed 10th June—6 months for inrolment.

John George Bodmer, of Manchester, engineer, for certain improvements in machinery for propelling vessels on water; parts of which improvements apply also to steam-engines to be employed on land.—Sealed 10th June—6 months for inrolment.

Edward Hammond Bentall, of Heybridge, ironfounder, for certain improvements in ploughs.—Sealed 10th June—6 months for inrolment.

Robert Oram, of Salford, engineer, for certain improvements in hydraulic presses.—Sealed 12th June—6 months for inrolment.

James Wills Wayte, of the Morning Advertiser Office, Fleet-street, engineer, for certain improvements in machinery or apparatus for letter-press printing.—Sealed 12th June—6 months for inrolment.

John Anthony Tielens, of Fenchurch-street, merchant, for improvements in machinery or apparatus for knitting, —being a communication.—Sealed 12th June—6 months for inrolment.

George Claudius Ash, of Broad-street, Golden-square, dentist, for improvements in apparatus for fastening candles in candlesticks.—Sealed 12th June—6 months for inrolment.

Edward Palmer, of Newgate-street, London, gent., for improvements in producing printing surfaces, and in the

printing china, pottery ware, music, maps, and portraits.—Sealed 12th June —6 months for inrolment.

Ezekiel Jones, of Stockport, mechanic, for certain improvements in machinery for preparing, slubbing, roving, spinning, and doubling cotton, silk, wool, worsted, flax, and other fibrous substances.—Sealed 12th June—6 months for inrolment.

Alexander Horatio Simpson, of New Palace Yard, Westminster, gent., Peter Hunter Irvin, and Thomas Eugene Irvin, both of Charles-street, Hatton Garden, philosophical instrument-makers, for their invention of an improved mode of producing light, and of manufacturing apparatus for the diffusion of light.—Sealed 17th June—6 months for inrolment.

Thomas Walker, of North Shields, engineer, for improvements in steam-engines.—Sealed 18th June—6 months for inrolment.

William Petrie, of Croydon, gent., for improvements in obtaining mechanical power; which are also applicable for obtaining rapid motion.—Sealed 19th June—6 months for inrolment.

John Haughton, of Liverpool, clerk, Master of Arts, for improvements in the method of affixing certain labels.—Sealed 19th June—6 months for inrolment.

John Godwin, of Cumberland-street, Hackney-road, piano-forte-maker, for an improved construction of piano-fortes of certain descriptions.—Sealed 23rd June—2 months for inrolment.

James Sidebottom, of Waterside, Glossop, manufacturer, for certain improvements in machinery or apparatus for preparing cotton and other fibrous substances for spinning.—Sealed 23rd June—6 months for inrolment.

William Chesterman, of Burford, Oxford, gent., for improvements in filtering liqnids.—Sealed 23rd June—6 months for inrolment.

George Thomas Day, of Upper Belgrave-place, Pimlico, gent., for an improved apparatus for creating draft, applicable to chimnies and other purposes.—Sealed 23rd June —6 months for inrolment.

John Henry Le Keux, of Southampton-street, Pentonville, engraver, for an improvement in line engraving, and in producing impressions therefrom.—Sealed 23rd June—2 months for inrolment.

Miles Berry, of the Office for Patents, 66, Chancery-lane, civil engineer and patent agent, for a new or improved engine, machine, or apparatus, for producing or obtaining motive power, by means of gases or vapours, produced by combustion,—being a communication.—Sealed 23rd June—6 months for inrolment.

John Lee Stevens, of King Edward-street, Borough, general agent, and John King, of College Hill, London, printer, for certain improvements in candlesticks and other candle holders.—Sealed 25th June —6 months for inrolment.

CELESTIAL PHENOMENA FOR JULY, 1841.

D.	H.	M.	
1			Clock before the sun, 3m. 25s.
	—		☽ rises 7h. 10m. A.
	—		☽ passes mer. 10h. 35m. A.
	—		☽ sets 1h. 14m. M.
	—		Occul γ Ophiuchi im. 9h. 35m. em. 10h. 56m.
		47	☉ in Apogee.
	2	37	♀ in Aphelion
2	5	9	♄ in conj. with the ☽ diff. of dec. 4. 25. N.
3			Occul ψ Sagittarii im. 13h. 7m. em. 14h. 26m.
3	6	28	Ecliptic oppo. or ○ full moon
4	12		☽ in Apogee.
5			Clock before the sun, 4m. 9s.
	—		☽ rises 9h. 26m. A.
	—		☽ passes mer. 1h. 4. M.
	—		☽ sets 5h. 11m. M.
9			Pallas stationary.
	12	57	Her: in conj. with the ☽ diff. of dec. 5. 4. S.
10			Clock before the sun, 4m. 57s.
	—		☽ rises 10h. 32m. A.
	—		☽ passes mer. 4h. 35m. M.
	—		☽ sets 11h. 6m. M.
	10	30	☿ in Aphelion.
11	8	30	☽ in □ or last quarter.
12	20	26	☿ stationary.
13	10	26	♃'s third satt. will im.
14	22	59	♀ in conj. with the ☽ diff. of dec. 8. 27. S.
15			Clock before the sun, 5m. 34s.
	—		☽ rises 0h. 3m. M.
	—		☽ passes mer. 8h. 47m. M.
	—		☽ sets 5h. 42m. A.
	9	23	Ceres in □ with the ☉
16			Mercury R.A. 8h. 39m. dec. 14. 2. N.
	—		Venus R. A. 4h. 28m. dec. 18. 1. N.
	—		Mars R. A. 13h. 52m. dec. 12. 50. S.
	—		Vesta R. A. 1h. 58m. dec. 4. 11. N.
	—		Juno R. A. 12h. 12m. dec. 4. 46. N.

D.	H.	M.	
	—		Pallas R. A. 23h. 4m. dec. 9. 35. N.
	—		Ceres R. A. 1h. 42m. dec. 1. 18. S.
	—		Jupiter R. A. 16h. 36m. dec. 21. 32. S.
	—		Saturn R. A. 17h. 51m. dec. 22. 26. S.
	—		Georg. R. A. 23h. 40m. dec. 3. 0. S.
	—		Mercury passes mer. 1h. 12m.
	—		Venus passes mer. 20h. 51m.
	—		Mars passes mer. 6h. 15m.
	—		Jupiter passes mer. 3h. 58m.
	—		Saturn passes mer. 10h. 13m.
	—		Georg. passes mer. 15h. 0m.
	9	23	♃'s second satt. will em.
18			☉ eclipsed invis. at Greenwich.
	2	13	Ecliptic conj. or ● new moon.
	3		☽ in Perigee.
21	1		☿ in conj. with the ☽ diff. of dec. 4. 22. S.
20			Clock before the sun, 5m. 59s.
	—		☽ rises, 6h. 35m. M
	—		☽ passes mer. 1h. 37m. A.
	—		☽ sets 8h. 58m. A.
	11	5	♃'s first satt. will em.
23	17	8	Vesta in □ with the ☉
	18	28	♀ greatest hel. Lat. S.
24	8	22	♀ greatest elong. 45. 38. W.
25			Clock before the sun, 6m. 10s.
	—		☽ rises 1h. 31m. A.
	—		☽ passes mer. 6h. 10m. A.
	—		☽ sets 10h. 18m. A.
	4	16	♂ in conj. with the ☽ diff. of dec. 4. 11. N.
	8	21	☽ in □ or first quarter.
27	10	38	☿ in Inf. conj. with the ☉
27	22	50	♃ in conj. with the ☽ diff. of dec. 5. 3. N.
29	7	50	♄ in conj. with the ☽ diff. of dec. 4. 30. N.
30	20	26	♂ in □ with the ☉
	21	10	☿ greatest Hel. Lat. S.
31	18		☽ in Apogee.

J. LEWTHWAITE, Rotherhithe.

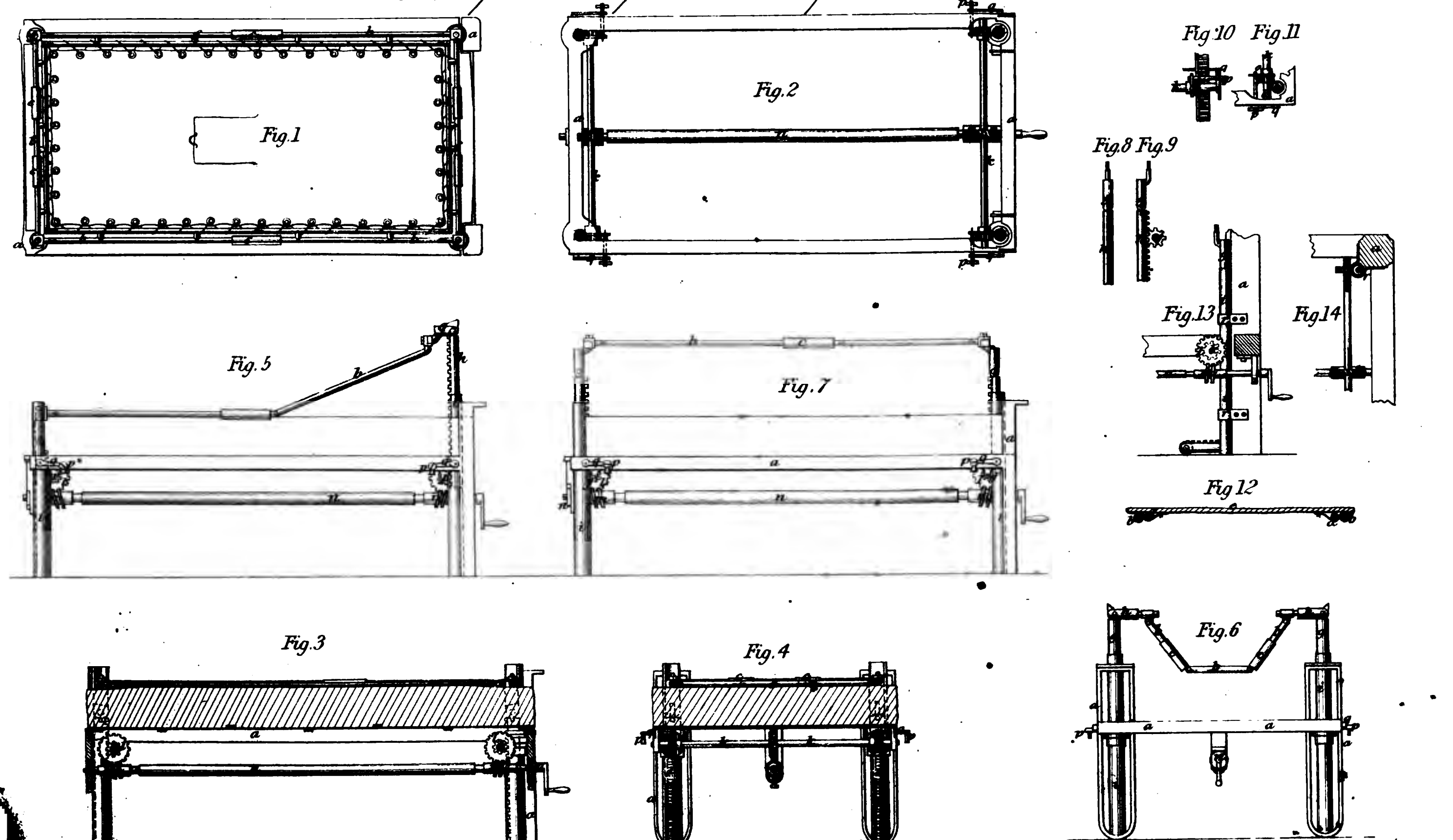
INDEX TO VOL. XVIII.

[CONJOINED SERIES.]

CONJOINED SERIES

PLATE I.

Thompson's Improved Bed for Invalids

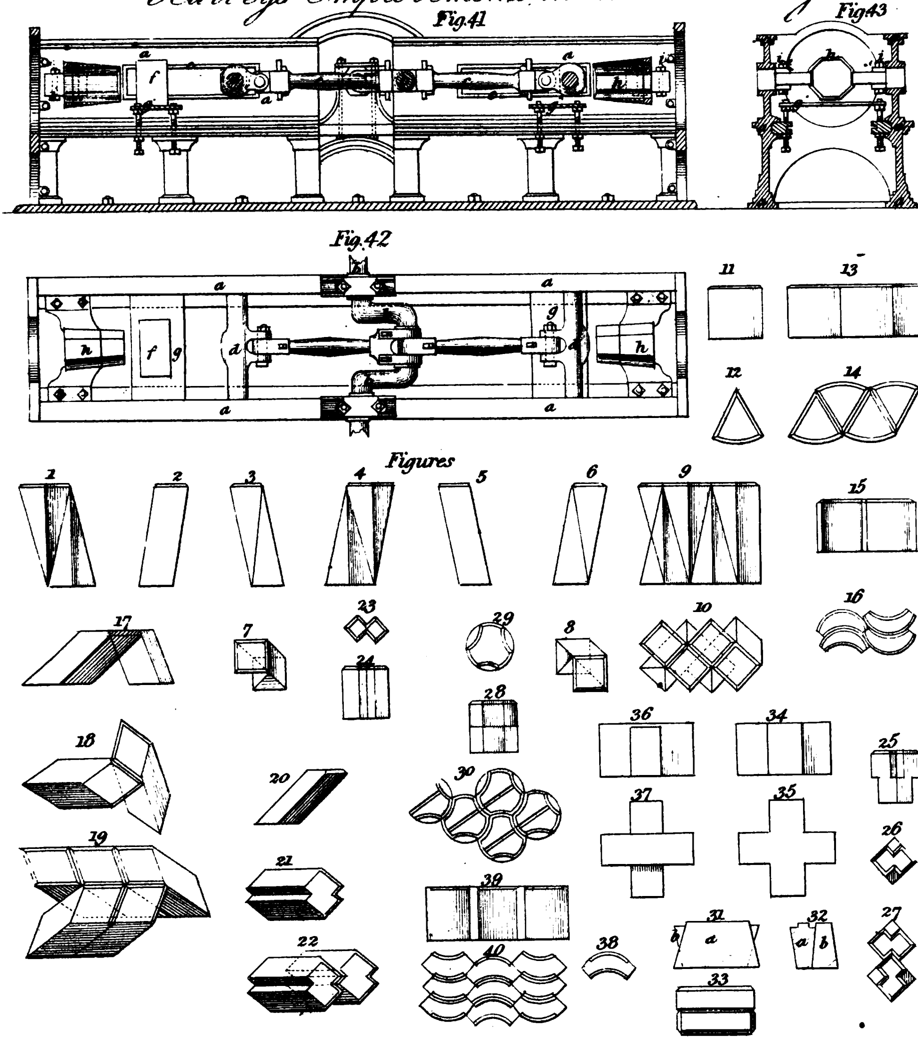


Newton Del.^t

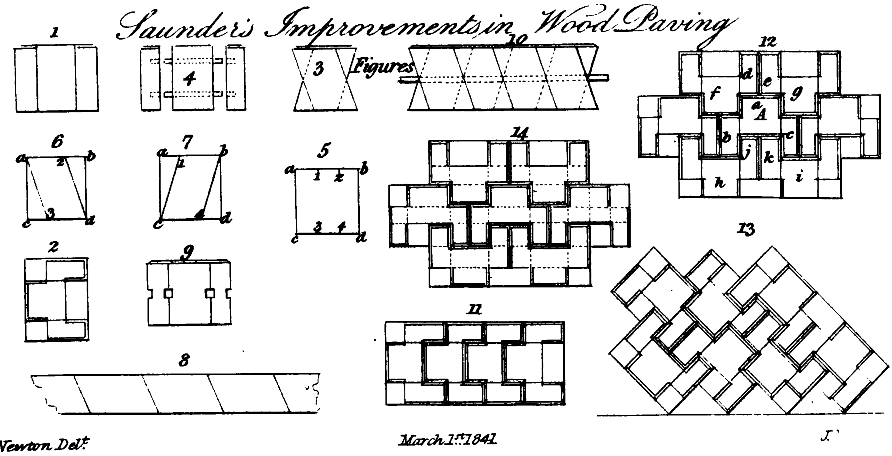
March 1^st 1841.

T. Sherratt Sculp.^t

Harvey's Improvements in Wood Paving

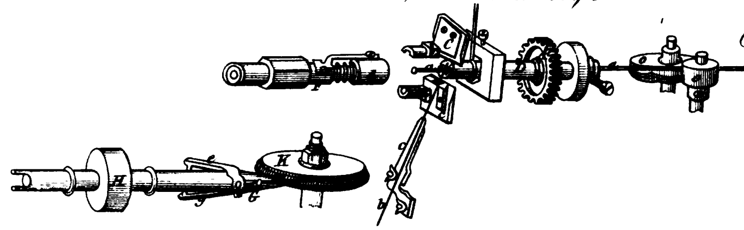


Saunder's Improvements in Wood Paving

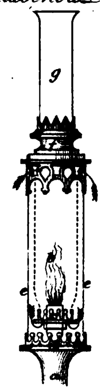


W. Newton Delt. March 1st 1841

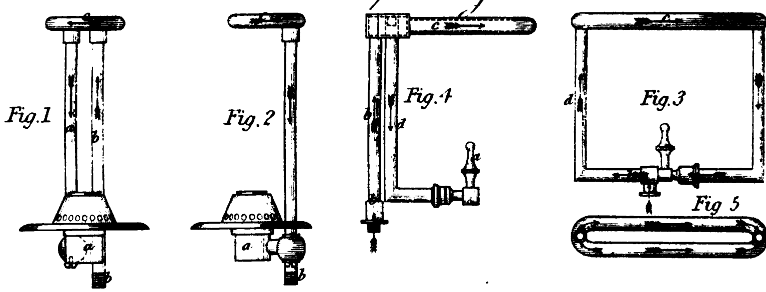
Brown's Pin Machinery.



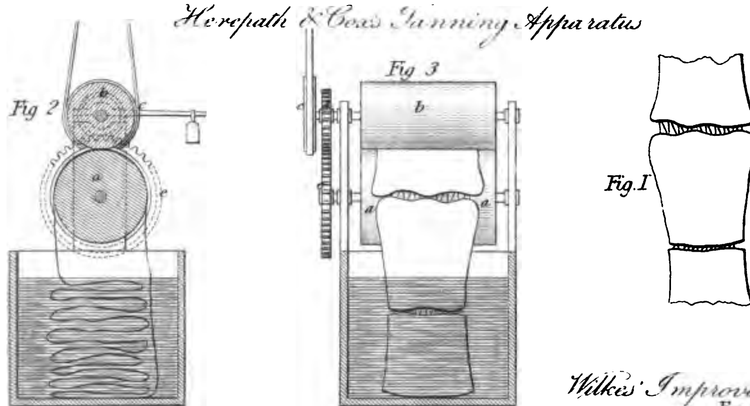
Chaussenot's Lamp



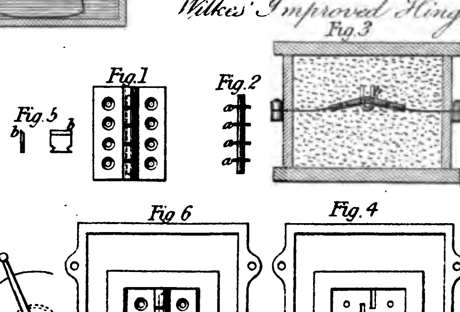
Smith's Improved Gas Burner.



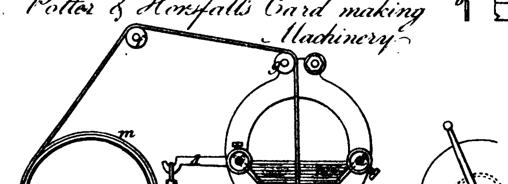
Herepath & Cox's Tanning Apparatus



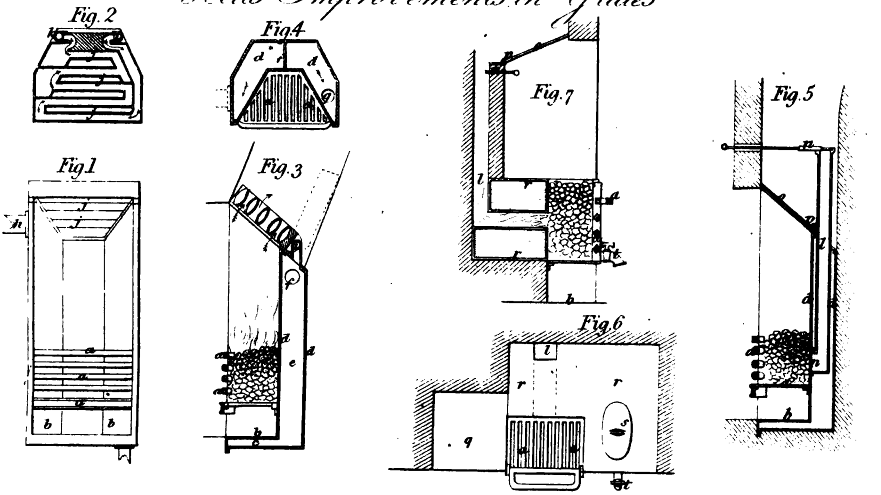
Wilkes' Improved Hinges



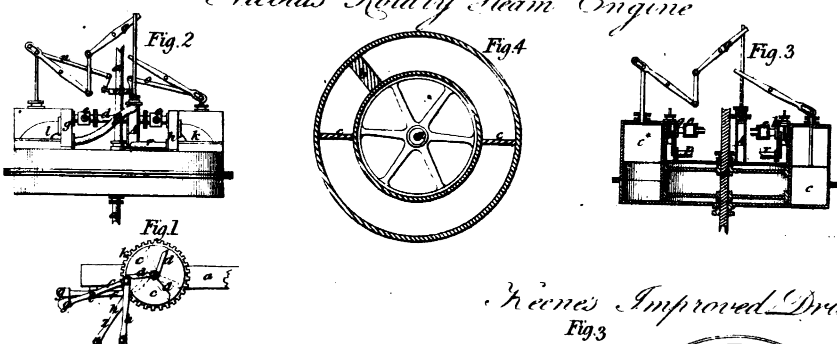
Potter & Horsfall's Card making Machinery.



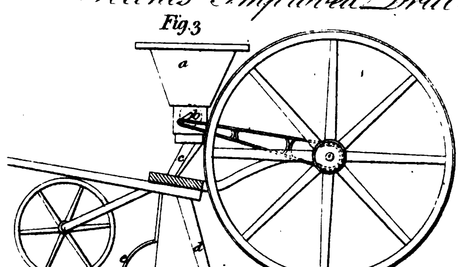
Hett's Improvements in Grates



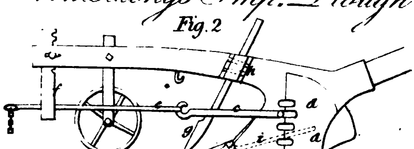
Nicola's Rotary Steam Engine



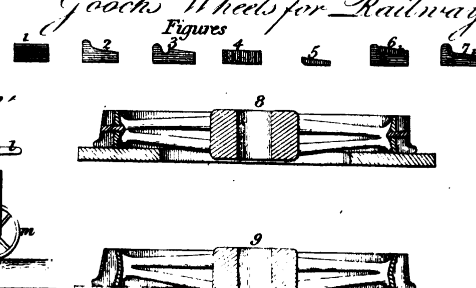
Keene's Improved Drill



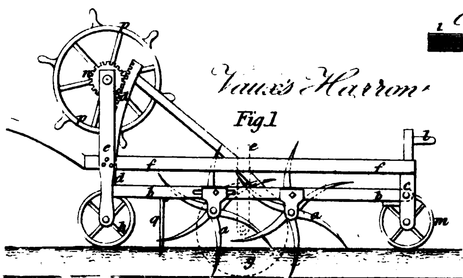
Armstrong's Impd. Plough



Gooch's Wheels for Railways



Vaux's Harrow



Matthews & Leonard's Saw Frame

Fig 1

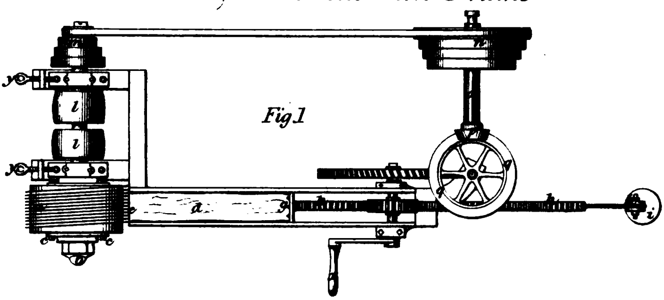
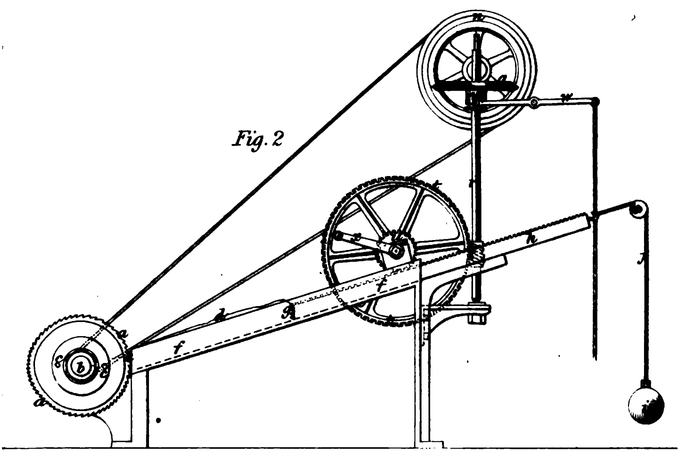


Fig. 2



Noble's Improved Pu.

Fig. 1

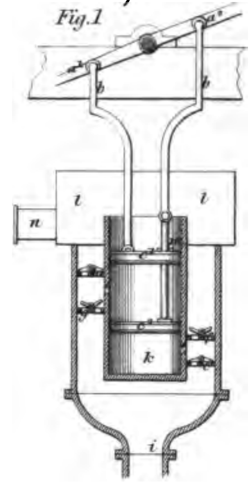
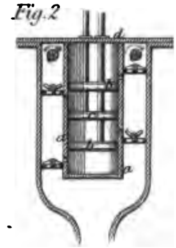


Fig. 2



Davies' Improved Clock

Fig 1

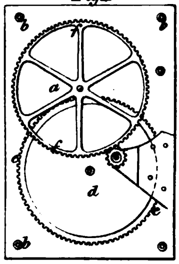


Fig. 2

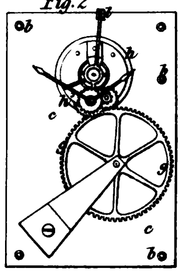
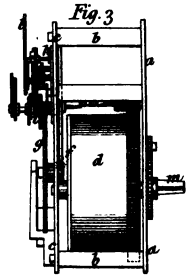


Fig. 3



Beart's Coffee Pot

Fig 1

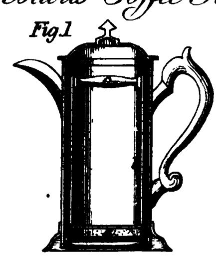
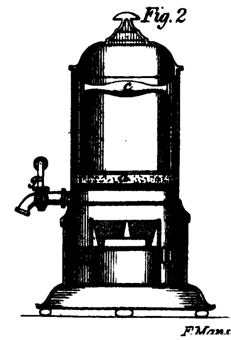


Fig. 2



Haddan's Improved Propeller

Fig 1

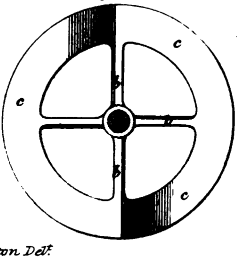
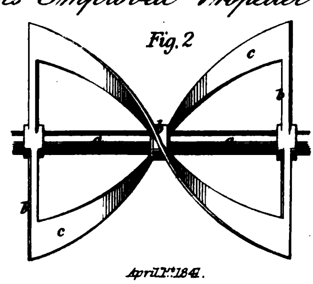
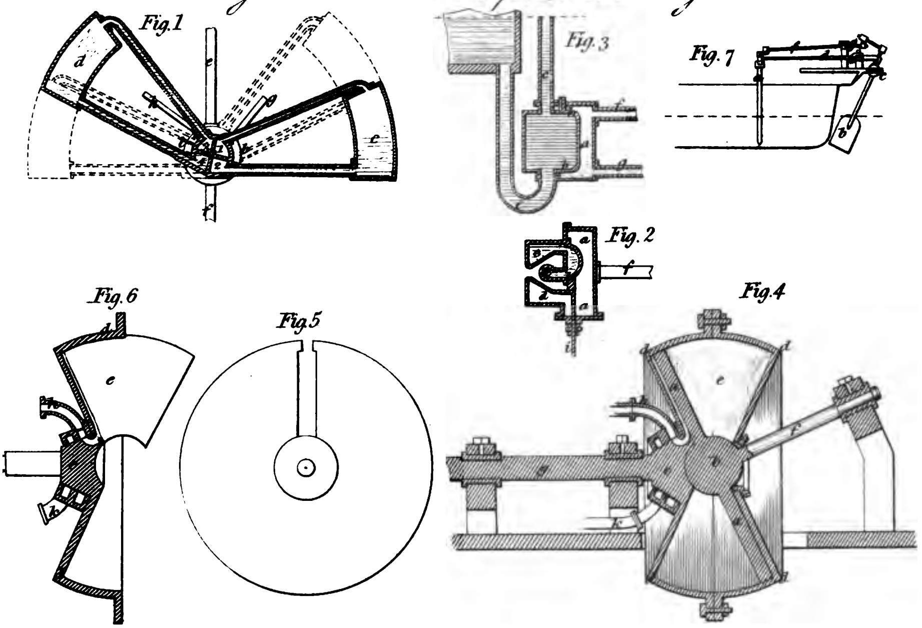


Fig. 2

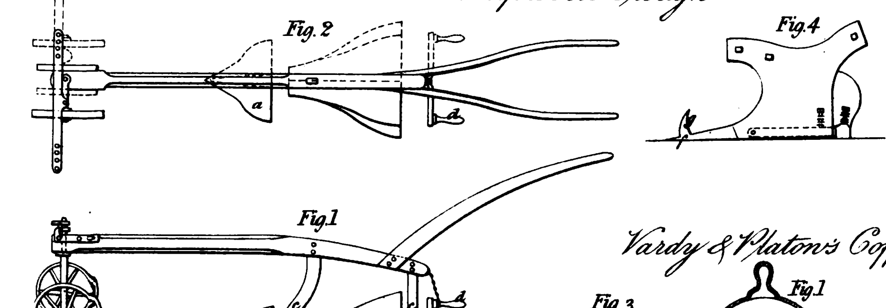


W. Newton Del^t. April 1st 1841. F. Mansell.

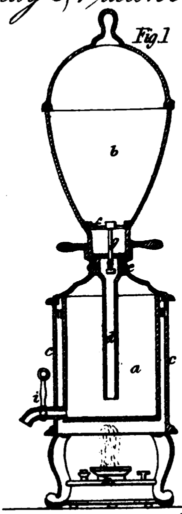
Taylor & Davies' Impd. Steam Engine



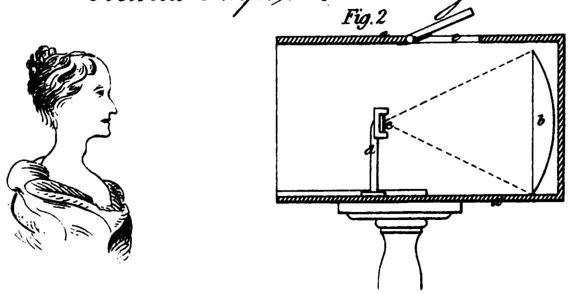
Huckvales Improved Plough



Vardy & Platon's Coffee P



Beards Impts. in obtaining Likenesses



W. Newton Delt. 1st April 1841. G. Wint.

Aitkin's Improvements in Drawing Cotton

Fig. 3

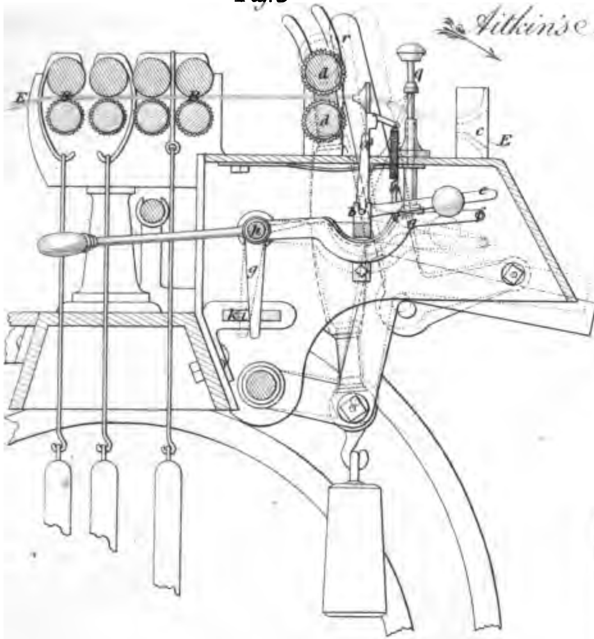


Fig. 1

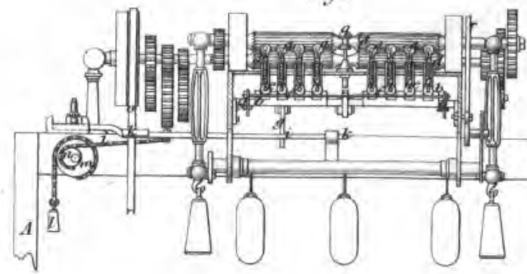


Fig. 2

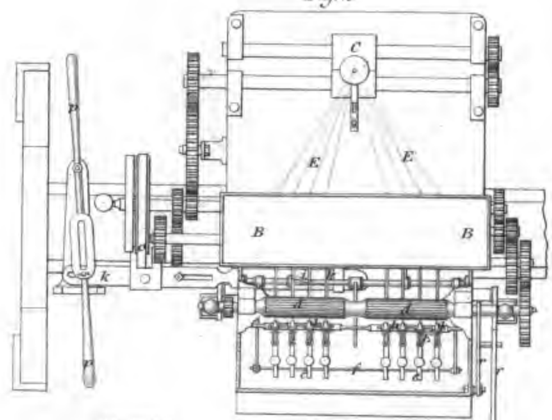
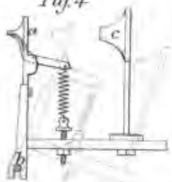


Fig. 4



Upton's Steam Power.

Fig. 5

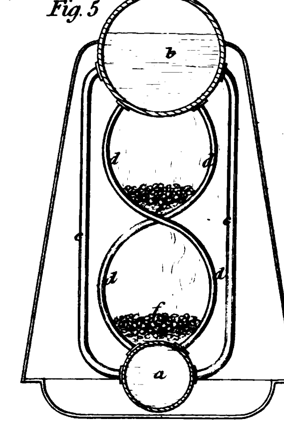
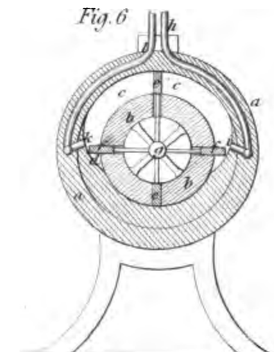


Fig. 6

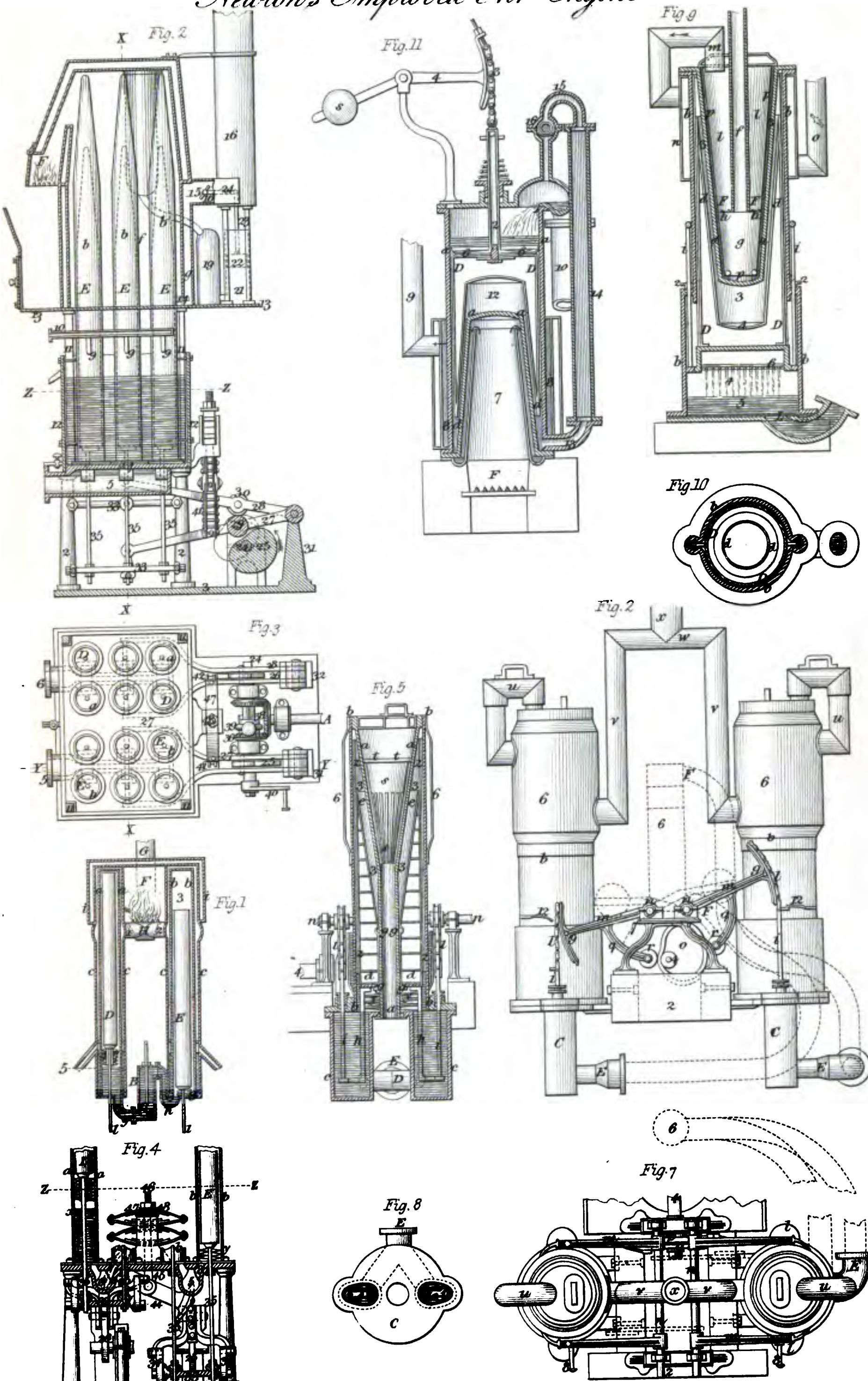


W. Newton Del.

May 1st 1842.

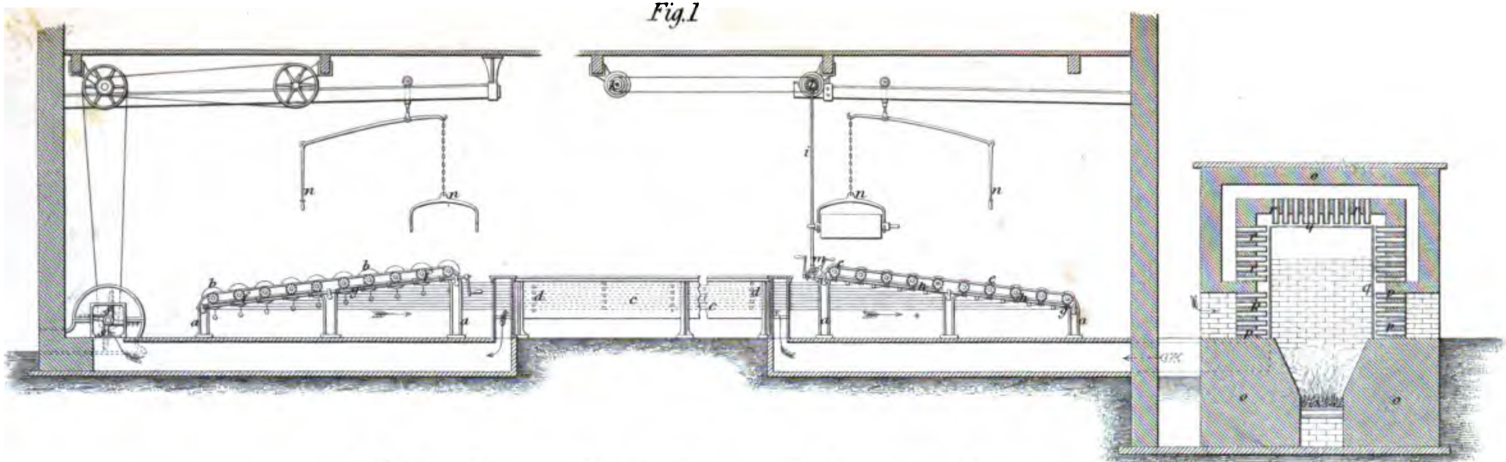
T. Sherratt Sculp.t

Newton's Improved Air Engine



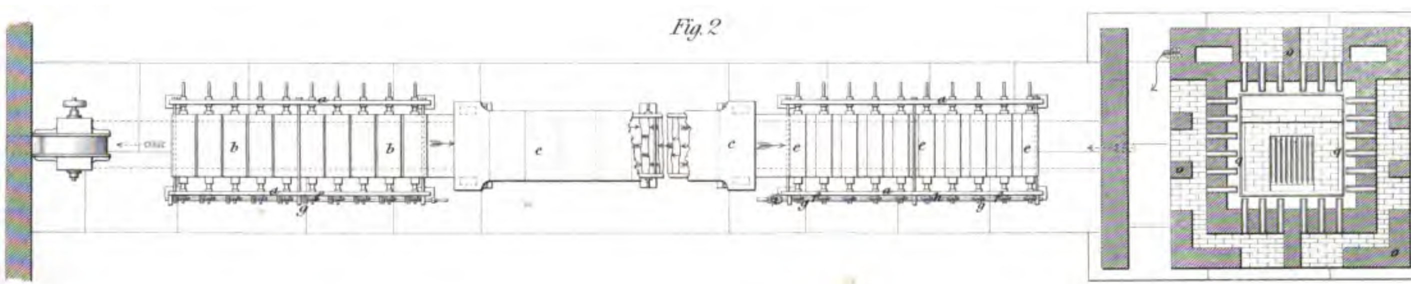
W. Newton Delt. 1st May 1841. U.A.Ber

Fig.1



Hick's Improved Machinery for Drying Cotton &c

Fig.2



Newton Del.^t 1.^st May 1841 G.Gladwin Sculp.^t

Dircks' Impts. in Steam Engines & Railway Wheels

Bertie & Gibbon's Lace Machinery

Fig.1

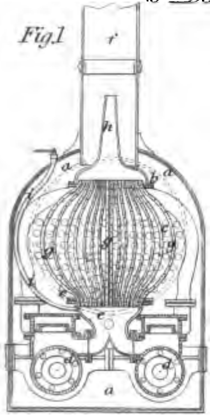


Fig.2

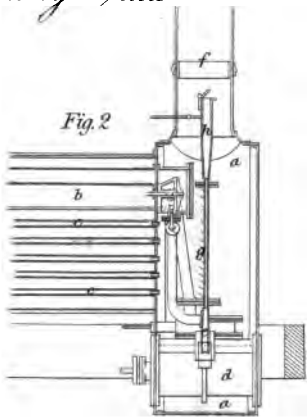


Fig.16

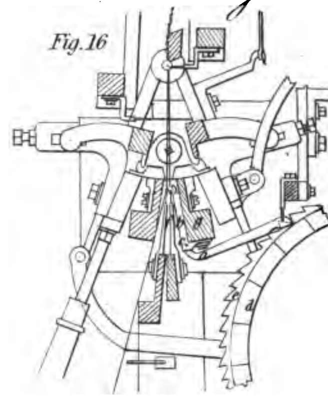


Fig.4

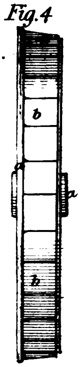


Fig.3

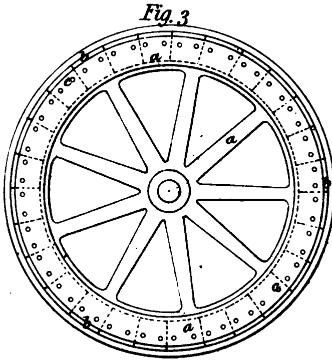


Fig.6

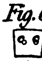


Fig.5

Fig.7

Fig.13

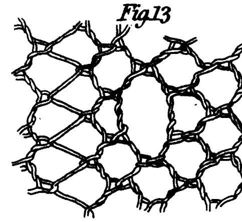


Fig.14

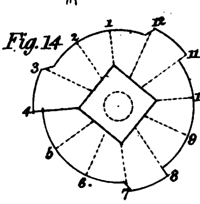


Fig.9

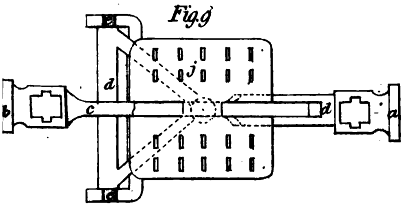


Fig.11

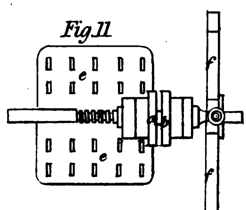
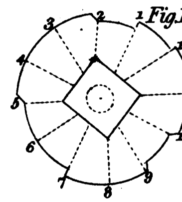


Fig.15



Whites Improvements in Vices

Fig.8

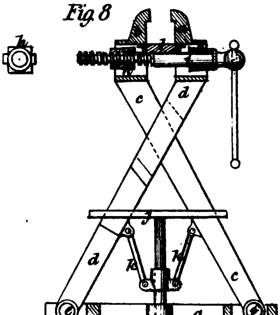


Fig.10

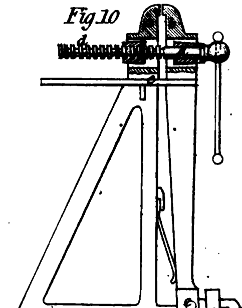
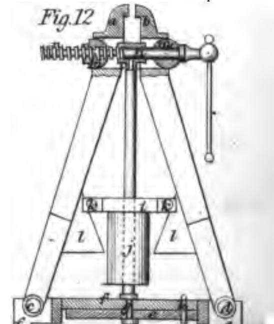


Fig.12



Newton Delt. 1st May 1841. J.Basi

William's Impts in materials for Roofing

Fig. 2

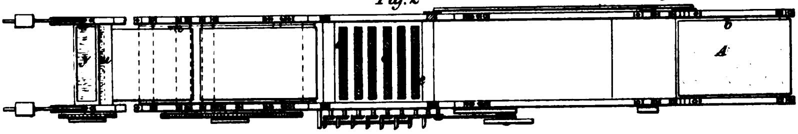
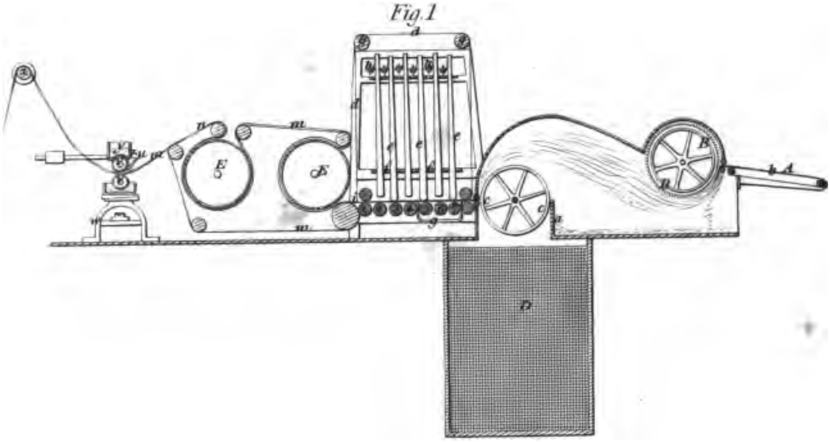


Fig. 1



Ralston's Impts in rolling Iron

Fig. 3

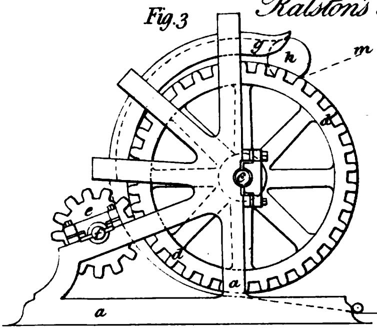
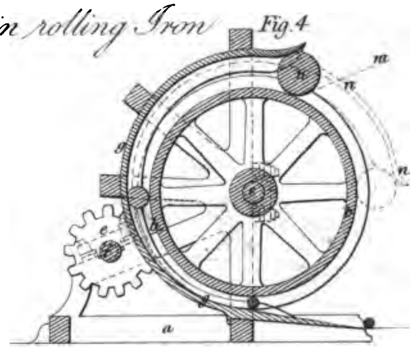


Fig. 4



Horne's Impts in making Hinges

Fig. 1

Fig. 6

Fig. 13

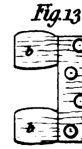


Fig. 2

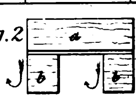


Fig. 4

Fig. 3

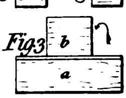


Fig. 5

Fig. 7

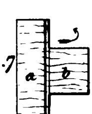
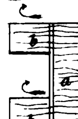


Fig. 8



Figs. 9, 10, 11, 12

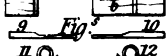
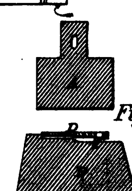
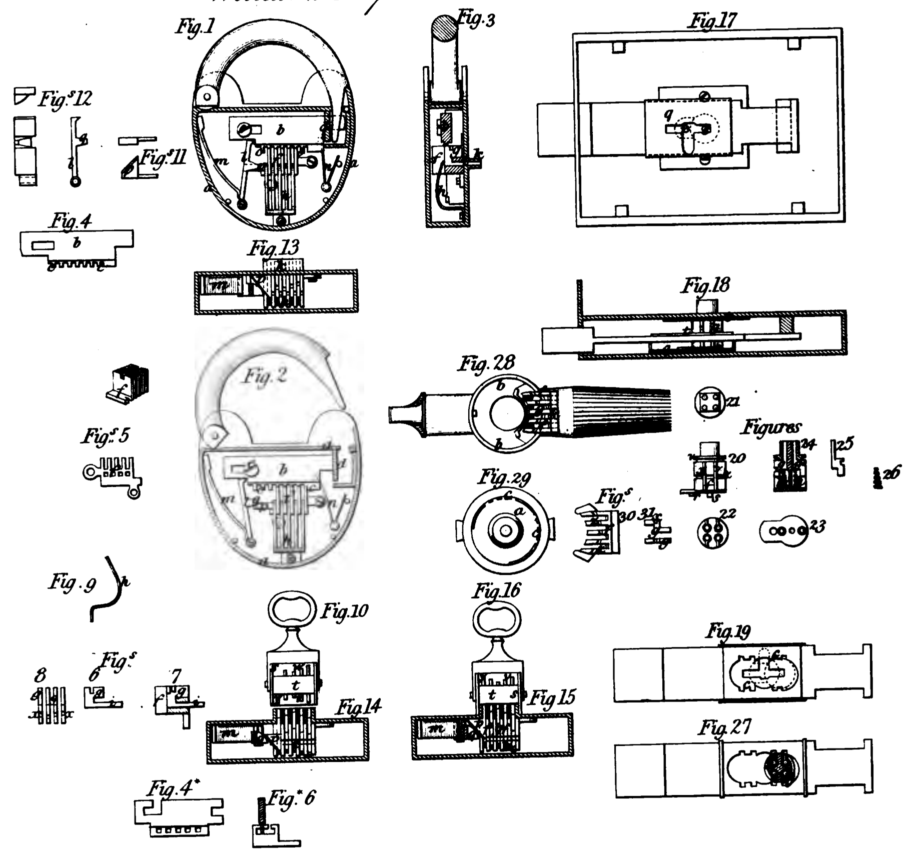


Fig. 14

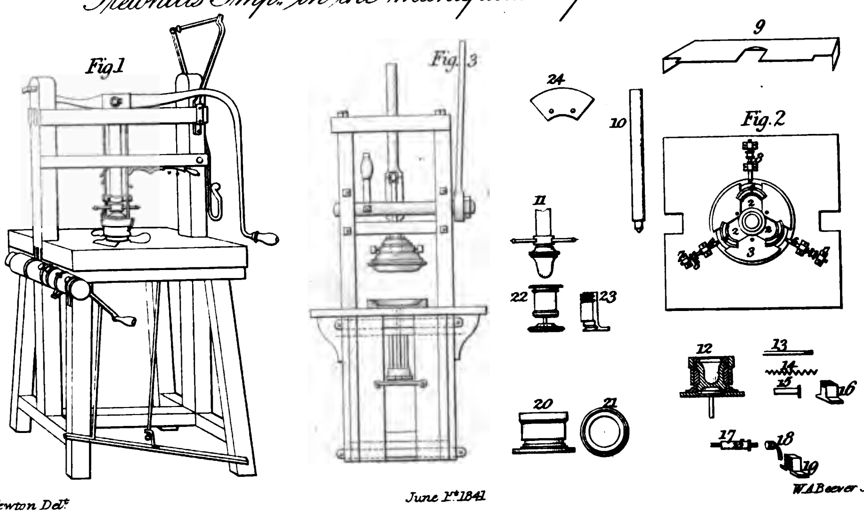


W. Newton Delt. May 1st 1841 G. Winter Sculpt.

Williams' Improvements in Locks

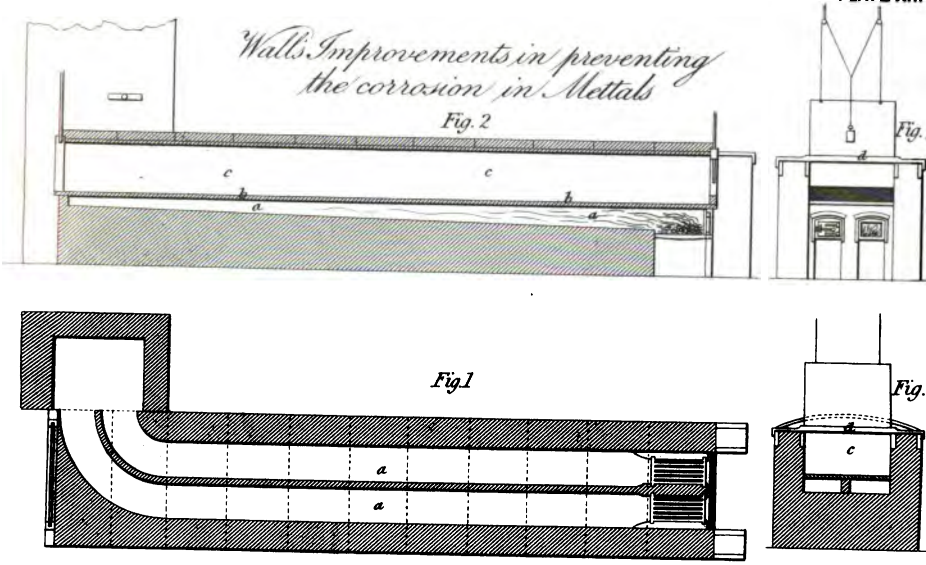


Trewhitt's Impts. in the manufacture of Earthenware

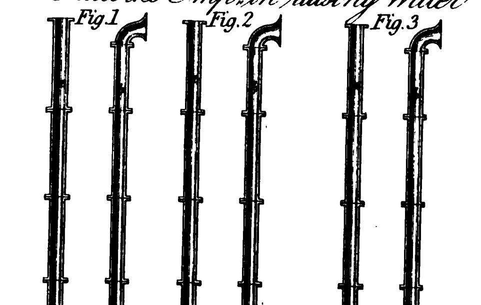


W. Newton Delt. June 1st 1841 W.A. Beever Sc.

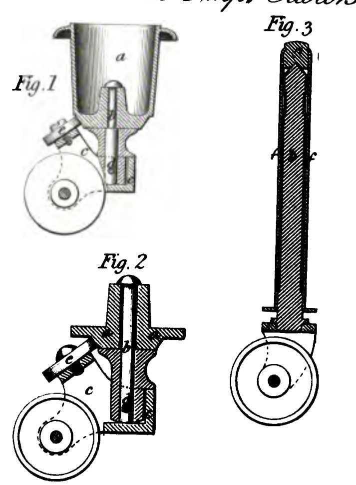
Wall's Improvements in preventing the corrosion in Mettals



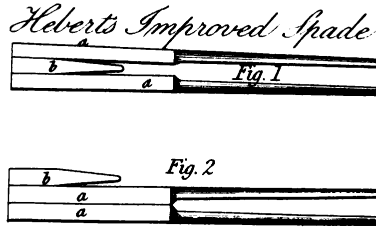
Adcock's Impts. in raising Water



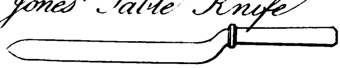
Harcourts Impd. Castors



Heberts Improved Spade



Jones' Table Knife



W. Newton Delt. June 1st 1841. G. Gladwin

Whitworth's Machinery for cleaning roads

Fig. 1

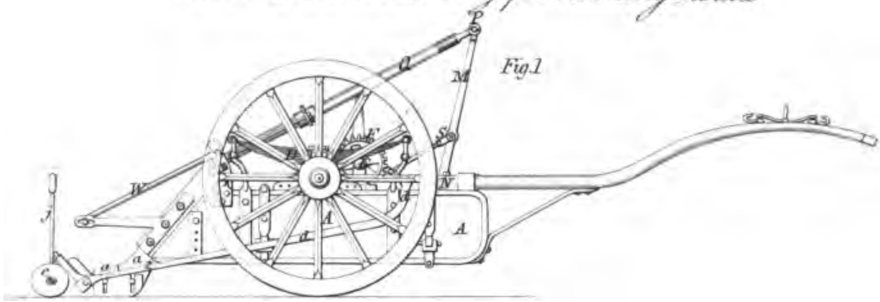


Fig. 3

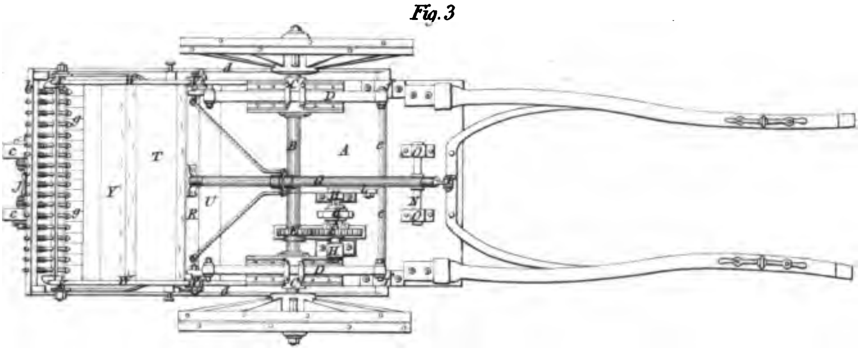


Fig. 2

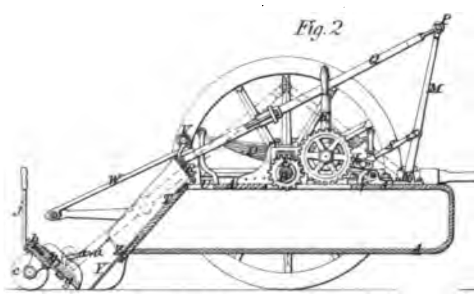


Fig. 4

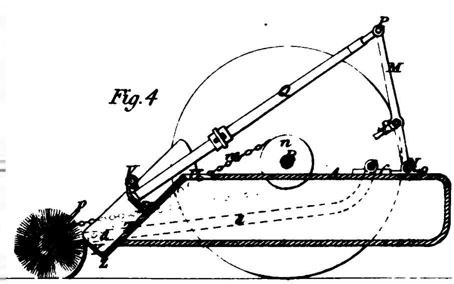


Fig. 5

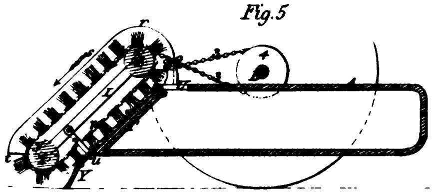
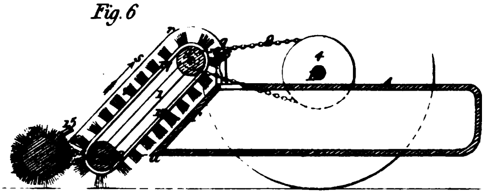
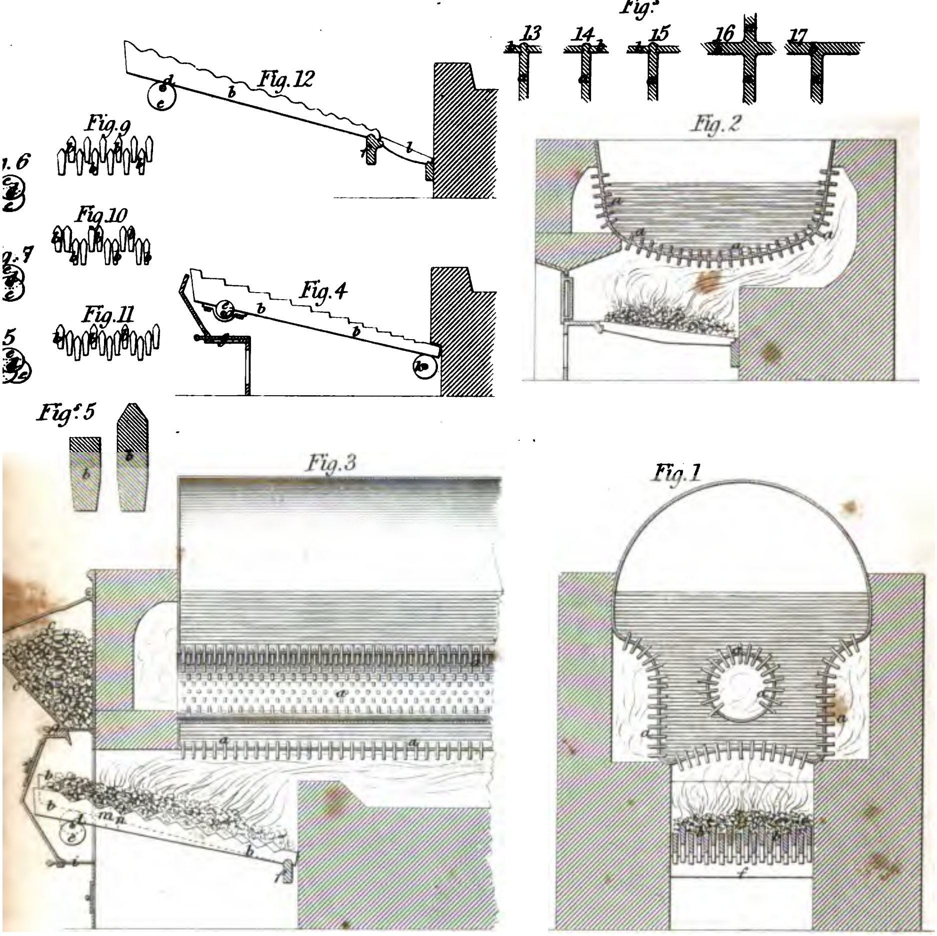


Fig. 6

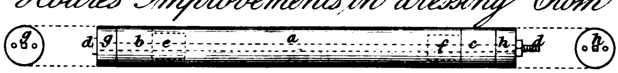


W Newton Delt. June 1st 1841 F Mansell Sc.

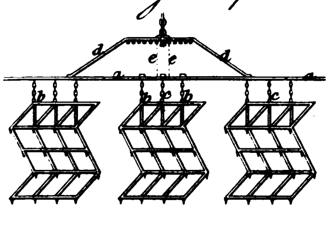
William's Improvements in generating Heat



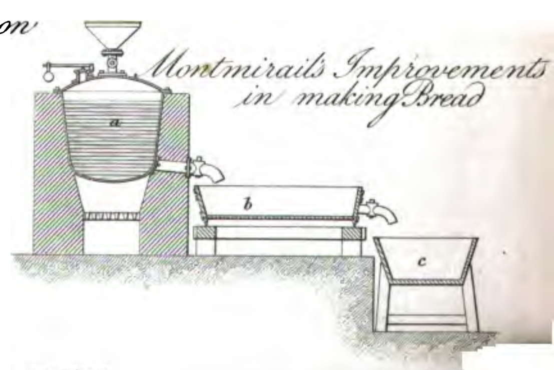
Hoare's Improvements in dressing Cloth



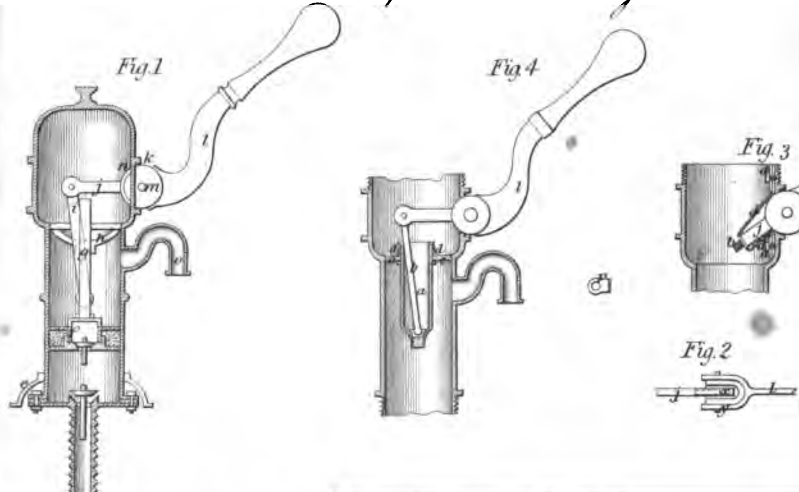
Armstrong's Impd. Harrow



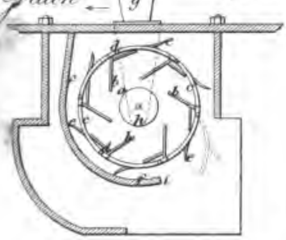
Montmirail's Improvements in making Bread



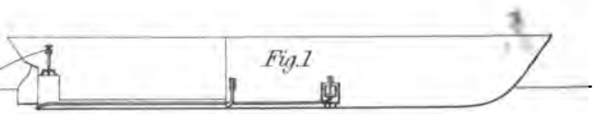
Noone's Improved Beer Engine

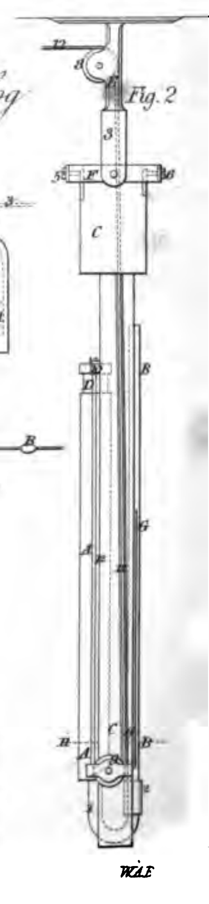


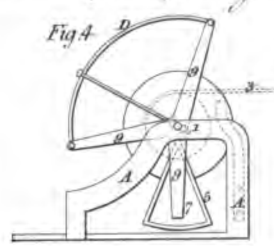
Hornsbys Impts in Sowing Grain

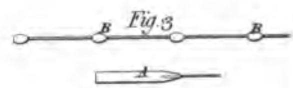


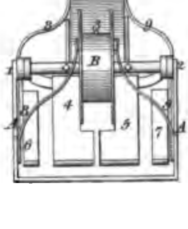
Williams' Impd Ships Log



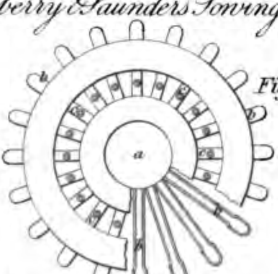








Newberry & Saunders Sowing Grain



Kollman's Impd Rails for Railways